USSR Report

EARTH SCIENCES

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USSR REPORT

Earth Sciences

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METEOROLOGY

OCEANOGRAPHY

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METEOROLOGY

DISTRIBUTION OF ATMOSPHERIC METHANE CONCENTRATION OVER DIFFERENT TECTONIC
REGIONS

[Article by Ye.V. Stadnik, I.Ya. Sklyarenko, I.S. Guliyev and A.A.
Feyzullayev, All-Union Nuclear Geophysics and Geochemistry Scientific
Research Institute, Moscow]

[Abstract] Measurements of atmsopheric methane concentration were made over
the territories of Donetsk and Rostov Oblasts, Krasnodarsk Kray, the Uzbek,
Kazakh, Turkmen, Azerbaijan, Georgian and Armenian republics. About 400
measurements were made at altitudes of 50-5,000 m. These areas took in
different tectonic regions, such as the East European and Epi-Hercynian
Platforms as well as the Alpine geosynclinal region, including the South
Caspian Depression. A table gives the averaged data for an altitude of 50-
150 m in different regions. All measurements were made in October, thereby
excluding season as an influencing factor. The greatest concentrations were
over the territories of the Turkmen SSR, Mangyshlak Oblast and Azerbaijan
SSR. The lowest concentrations were over Donetsk and Rostov Oblasts. Data
were also grouped by tectonic region: platform or geosynclinal. With transi-
tion from geosynclinal regions to ancient platforms there is a distinct
decrease in methane concentration in the lower layers, attributable to differ-
ent geological and tectonic conditions for the migration of methane into the
atmosphere. Ancient platforms are tectonically quiet and subvertical migration
processes are difficult. In geosynclinal regions there are favorable condi-
tions for the subvertical migration of lithospheric gases due to the revival of
existing and appearance of new fractures, dislocations and faults. The data
demonstrated a definite influence of geotectonic conditions on formation of the
atmospheric methane field. There is a distinct relationship between atmospheric
methane concentration and the presence of petroleum- and gas-bearing structures
beneath the earth's surface. The geotectonic factor exerts an influence on
methane concentration to the level 2,000-2,500 m. The presence of petroleum and
gas in the underlying geological formations is reflected only in the lower
layers of the atmosphere (up to 50-150 m).

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REEXAMINATION OF IDEAS RELATING TO CARBON DIOXIDE PROBLEM

[Article by S.P. Gorshkov, Moscow]

[Abstract] There is great uncertainty concerning the quantity of carbon dioxide annually produced by man's economic activity. But it is unanimously agreed that with an increase in the quantity of CO_2 there should be an increase in the productivity of surface vegetation and an increase in the yield of agricultural crops. A statistical analysis indicates that the annual emission of anthropogenic CO_2 (C) into the atmosphere in the late 1970's-early 1980's was about 11 billion tons/year and therefore the annual atmospheric increment of CO_2 concentration should be 5.2 million^{-1}. However, since during this time the annual CO_2 increment on the average did not exceed 1.4 million^{-1} it appears that the atmosphere retains about 30% of the anthropogenic emission of CO_2. Those authors who assume that the combustion of fossil fuel gives 70-80% of the anthropogenic contribution to CO_2 content contend that up to 50% of this gas is retained by the atmosphere, this being based on a definite underevaluation of anthropogenic reduction of the biosphere. Almost 8 billion tons of CO_2 (C) obviously remain unaccounted for. It is believed that ocean waters are the main absorber of anthropogenic CO_2, but it is entirely probable that land biota and the soil cover are becoming assimilators of "excess" atmospheric CO_2. If it is postulated that the 20% increase in CO_2 during the last 100-130 years has resulted in an increase in productivity by 10%, the present-day additional absorption of CO_2 from the atmosphere should be about 6 billion tons in carbon. Should this be the case, the main role in attenuating atmospheric CO_2 accumulation even now is being played by the soil-biotic layer of the land, despite its accelerating anthropogenic destruction. The ocean has a more limited buffer function. This conclusion is supported by experimental data on the dependence of productivity of vegetation on an increase in the concentration of atmospheric CO_2 and reports on progressive rates of growth of tree rings. There is no validity for the ominous warnings concerning overheating of the earth in the 21st century. More attention should be focused on the increasing productivity of terrestrial biota and improvement in state of the soil cover as a result of the anthropogenic fertilization of the air with carbon dioxide. Figures 5; references 26: 12 Russian, 14 Western.

MARINE ENCYCLOPEDIC REFERENCE WORK PUBLISHED

Leningrad LENINGRADSKAYA PRAVDA in Russian 17 Oct 86 p 4

[Text] The first volume of a Marine Encyclopedic Reference Book (Morskoy entsiklopedicheskiy spravochnik) has come off the presses of the "Sudostroyeniye" Publishing House. This work, the first of its kind to be published in our country, was edited by Academician N.N. Isanin.

The new publication will consist of two volumes.

It deals extensively with scientific-technical, economic, industrial and technological questions connected with development of ships, navigation and exploration of the world's oceans.

Shipbuilders, seamen and all lovers of seafaring can find in it information about outstanding scientists, oceanologists and mariners, and about major shipping companies and shipyards of the world.

The edition is richly illustrated with color and black-and-white photographs.

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COSMONAUT L. DEMIN DESCRIBES LASER-AIDED WATER POLLUTION STUDIES

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 24 Oct 86 p 2

[Text] For several days in a row, the bright green beam of a laser could be seen shining over Gelendzhik Bay. A joint expedition of the research-and-production association "Yuzhmorgeo" (Southern marine geology) and the USSR Academy of Sciences' Institute of General Physics was at work on a research vessel here. Probing the sea, scientists and specialists gathered data regarding its condition.

USSR pilot-cosmonaut L. Demin, who is an associate of "Yuzhmorgeo" and a Hero of the Soviet Union, told our correspondent V. Lagovskiy about the results of the expedition that has just ended:

"Our expedition compiled an accurate map of pollution in the bay; it determined the source of pollution, meaning specific guilty parties. The experiments have convinced us that laser beams make it possible from a distance to detect the smallest impurities in water, and to determine their composition and distribution by depth. Rapid processing of the information makes it possible to monitor the dynamics of the process and to keep track of the spread of pollution.

"The expedition also confirmed some theoretical propositions of scientists. An effect was discovered which I believe will permit both quantitative and qualitative evaluations to be obtained with the aid of laser probing. In other words, in the future we will be able from a distance, without taking samples for laboratory analysis, to determine not only the composition of pollutants but also their concentration.

"Methods of laser monitoring of the condition of the environment are still in their infancy. It was important that the expedition demonstrated the productiveness of cooperation between industrial and scientific organizations in the development and introduction of the latest achievements of science and technology."

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MODELING OF LONG-WAVE MOVEMENTS USING AN AREA ALIGNING TRANSFORM

[Article by N.Ye. Voltsinger and K.A. Klevannyy, Oceanology Institute, USSR
Academy of Sciences; Leningrad Hydrometeorological Institute]

[Abstract] The major difficulty in the numerical solution of boundary-value
problems for shallow-water equations is to find stable boundary approximations.
An alternative to the traditional method of approximating a curved boundary by
straight sectors is transition to a natural curved system of coordinates, the
boundary coordinates of a line in which coincide with the contour of the
assigned area. This article presents a method for numerical integration of
boundary-value problems in such a curved area based on an aligning transform
and splitting of a 2-dimensional operator. Explicit methods are used to
calculate long-wave oscillations of water level, combining simplicity with
the required level of detail of evolution of the process. Results are pre-
sented from a test application of the process taken from data on the Leningrad
flood of 1955. The results demonstrate the capabilities of effective solution
of boundary-value problems in curved areas for simulation of long-wave
processes. Figures 3; references 6: 4 Russian, 2 Western.

RESULTS OF SYNCHRONOUS MEASUREMENTS OF SURFACE WAVES AND MICROPULSATIONS OF
ATMOSPHERIC PRESSURE ABOVE SEA

[Article by I.A. Alekperov, N.I. Akhmedov, A.I. Gumbatov, A.S. Ismailov,
R.M. Mamedov and T.M. Tatarayev, Space Research, Scientific-Production
Association, Azerbaijan Academy of Sciences]

[Abstract] Results from synchronous measurements of fluctuations in atmospheric
pressure and surface wind wave activity in a shallow region of the Caspian Sea
from a nonmoving platform under various wind and wave conditions are presented,
as well as results of determination of wave disturbances of fluctuations in
atmospheric pressure by means of the theory of filtration of steady processes.
Measurements are made on Darvin Bank, sea depth 7 m, with mean wind speeds
measured at 5.53, 7.53 and 8.5 m. Sea surface activity was measured with a
string wave recorder. Pressure pulsations wei measured with a mechanotron-
type pressure sensor. Wave disturbance spectra are compared with a spectrum
produced by model calculations, which are not presented. The model consisted
of a superposition of 32 traveling waves. Figures 6; references 14:
12 Russian, 2 Western.

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AUTO-OSCILLATIONS IN THE 'LARGE-SCALE CIRCULATION-SYNOPTIC OCEANIC EDDIES'
SYSTEM

[Article by D.G. Seidov, Oceanology Institute, USSR Academy of Sciences]

[Abstract] An attempt is made to compare the large-scale circulation-
synoptic eddy system with a previously known oscillating system which
effectively describes feedback which may to some extent simulate actual feed-
back loops which arise when large-scale currents interact with synoptic
eddies. The eddy-resolving model used is constructed as a system of nonlinear
equations describing the balance of the mean relative vorticity and heat on
the assumption of incompressibility, hydrostaticity and geostrophicity of
motion of the shear components of current velocity. The solution is sought
numerically by a finite-difference method in a grid permitting explicit
resolution of synoptic eddies with dimensions on the order of 200 km. The

development of circulation of the temperature field is reproduced from a
state of rest with no horizontal temperature gradient in the water under the
influence of wind and as a result of heat exchange between the ocean and the
atmosphere. The movement of the air and its temperature at the ocean surface
are considered zonal and constant. Synoptic changes in the circulation of
the ocean are found to correspond in the first approximation to this relatively
simple dynamic system. Figures 8; references 21: 9 Russian, 12 Western.

NUMERICAL MODEL OF BAROCLINIC INSTABILITY OF AXISYMMETRIC VORTICES IN TWO-
LAYER OCEAN

[Article by V.F. Kozlov, V.G. Makarov and M.A. Sokolovskiy, Pacific Ocean
Institute, Oceanology Far Eastern Scientific Center, USSR Academy of
Sciences]

[Abstract] A contour dynamics method, based on generalization of the "water
bag" model developed in plasma theory and applied in recent years in various
areas of oceanography, is extended to a quasi-geostrophic model of a two-
layer ocean with a solid cover on the surface and an uneven bottom, with the
β effect taken into account. As an example, the problem of baroclinic
instability of axisymmetric eddies on the Ω plane is analyzed assuming a
horizontal bottom, when motion is initiated by piecewise-continuous distribu-
tion of potential vorticity in the layers. A numerical experiment confirms
the conclusions of linear analysis of stability and traces the nonlinear
stage of evolution of the system. The advantages of the model used include
a decrease in the dimensionality of the problem plus simplicity of inter-
pretation and clarity of representation of results. Figures 2; references
14: 8 Russian, 6 Western.

DEPENDENCE OF COMPOSITION AND STRUCTURE OF DEPOSITS OF FERROMANGANESE NODULES
ON THEIR ORIENTATION RELATIVE TO BOTTOM CURRENT

[Article by I.N. Goryainov, I.S. Gramberg, corresponding member, USSR Academy
of Sciences, and A.G. Prozhogin, All-Union Scientific Research Institute of
World Ocean Geology and Mineral Resources, Leningrad]

[Abstract] In an earlier study (I.N. Goryainov, et al., DAN, 279, No 1,
pp 163-166, 1984) it was demonstrated that Fe-Mn modules forming on slopes of
abyssal hills have a different bedding density, depending on whether the slope
is to the left or right relative to the bottom current. The thickness of the
nodules is related to the angle at which the current approaches the slope.
However, nothing has been published on the dependence of the chemical composi-
tion of the nodules and the relation of nodules, both buried and lying on the
surface of sediments, on the nature of the hydrodynamic regimes. A study of
this problem was made using the same material as employed in the earlier
research. The sector was geologically uniform. The slopes did not exceed
3°; bottom depth was 4,850-5,050 m. The hydrodynamic regimes of bottom
waters for different slopes are different. The differences involve the
degree of turbulence of waters and the parameters of the mean current vectors.
A series of circular diagrams was constructed for reflecting the dependence of
the nodular content on Mn, Fe, Cu, Ni, Co and nonore components on bottom
depth and slope dip direction. The diagrams revealed a clear differentiation
of the values of the considered criteria as a function of slope type; for
example, for Fe the maximum contents are on the leeward slopes, but for Ni
and nonore components the maximum contents are on the windward slopes; the
Co and Cu contents are on the "left" slopes relative to the current direction,
whereas the Mn maxima are primarily on the "right" slopes. On the upper part
of the hills the "left" slopes are richer, whereas in the lower part the
"right" slopes are richer. The density of nodule deposits is greater on
relatively gentle sectors of slopes than on relatively steep sectors. The
difference in hydrodynamic regimes gives rise to a potential difference
between different bottom sectors. In the process of nodule growth its lower
part, buried in sediment, plays the role of an anode, and its upper part
serves as a cathode. For deposits as a whole, like for an individual nodule,
it is possible to define sectors playing the role of cathode and anode. The
structure of Fe-Mn nodule deposits, together with many other significant
parameters of these nodules, is clearly dependent on the hydrodynamic regimes
of bottom waters governed by the position of the slope on which the nodules
lie relative to the general direction of the current. Figures 2;
references 9: 7 Russian, 2 Western.

POSTHUMOUS STAGE OF DEEP FAULT. HYDROTHERMAL PROCESS AND NEW TYPE OF
SEDIMENTATION TRAP IN FORMATION OF MANGYSHLAK MARINE MANGANESE ORES

[Article by I.P. Druzhinin, Lithosphere Institute, USSR Academy of Sciences,
Moscow]

[Abstract] Oligocene manganese mineralization was discovered in the Mangyshlak
region early in the century. There are stratal deposits of rhodochrosite and
manganocalcite with a thickness up to 2 m and with an extent of several hundred
meters. Various hypotheses as to their origin have been advanced, but new
facts have been revealed in a detailed geological survey, analysis of geo-
physical data and space photographs. It is clear that the pertinent
Oligocene rocks are related to the structure of a major flexural-fault zone
which can be regarded as the posthumous stage in the development of a deep
fault. This zone, at its juncture with feathering faults, formed tectonic
nodes and was permeable here for hydrothermal solutions. The latter penetrated
into the Middle Oligocene sea basin from deep endogenous sources. The new data
made possible reconstruction of the conditions for formation of primary
calcareous manganese ores. The specific details of the postulated mechanism
for the formation of high and increased ore concentrations of Mn in hydro-
dynamically active sediments are outlined. It was possible to discriminate
sectors of the most significant gradients of velocities of paleoflows and to
interpret them as a new type of sedimentation trap. The distinguishing
features of this new type of sedimentation trap are defined. A factor of
predominant importance is the presence of considerable velocity gradients only
in ore-bearing sandy sediments in a foredelta, belonging to a strictly marine
paragenesis. The greatest velocity gradient in the peripheral parts of the
paleoflows favored their enrichment with ore matter. The primary source of the
manganese ores was volcanic aqueous and gas emanations. References: 9 Russian.

NEW SUBMARINE VOLCANO IN WESTERN PART OF ALEUTIAN ISLAND ARC

[Article by N.I. Seliverstov, G.P. Avdeyko, A.N. Ivanenko, V.A. Shkira and S.A. Khubunaya, Volcanology Institute, Far Eastern Scientific Center, USSR Academy of Sciences]

[Abstract] A linearly elongated basement rise was discovered on the 21st cruise of the "Vulkanolog" in 1984 in the Bering Sea 40-60 km to the northeast of the Komandorskiye Islands (Fig. 1 is a structural plan of the region). This rise extends for more than 120 km subparallel to the Aleutian arc. A major underwater formation, called the Massiv Vulkanologov [Massif of the Volcanologists], was discovered on the central part of the rise. The peak part consists of very fresh massive dacites and dacitic pumices without any traces of secondary rock transformations. A comprehensive geophysical survey was carried out which included echo sounding, continuous seismic profiling and a magnetic survey with a distance of 5 miles between runs and with the raising of samples of volcanic rocks at two dredging stations. Details are given concerning the morphology of the volcanic complex and structure of the upper part of the section on the basis of continuous seismic profiling and echo sounding data, characteristics of the anomalous magnetic field, composition of rocks in the central cones of the volcanic complex, and structural position of the zone with manifestations of volcanism. Whereas the peak of the highest cone consists of dacites and dacitic pumices of the calcareous-alkaline series of island arcs, the remainder of the complex consists of more basic rocks having higher effective magnetization. The complex is magnetized in the direction of the present-day field and its age appears to be younger than 700,000 years. The peak area was possibly formed in the Holocene. The volcanic activity with evidence of being of the island arc type. Figures 8; references 21: 12 Russian, 9 Western.

TEST RANGE METHOD FOR SUBMARINE VOLCANO RESEARCH

[Article by A.M. Nadezhnyy and V.I. Bondarenko, Volcanology Institute, Far Eastern Scientific Center, USSR Academy of Sciences]

[Abstract] Two methods are now used in studying underwater mountains. In the first the observations are made in a system of runs intersecting at a single

point, forming a "star." In the second observations are made on a system of
parallel runs, sometimes with profiles intersecting at an angle. An effort
was made to clarify which of these systems is more informative under definite
conditions in detecting nonuniformities, such as of bottom relief, the
magnetic or other fields on underwater volcanoes. Models of observation
systems are examined and their advantages and disadvantages are pointed out;
several strategies are defined. This is illustrated in a number of specific
cases. Formulas are derived and reasonings are presented which can be used
in evaluating the results of both planned and already conducted investiga-
tions. The choice of the optimum parameters in the method for organizing test
range research over submarine volcanoes is described. For example, in check-
ing the reliability of a report on the occurrence of an underwater volcanic
eruption and investigating the site of the eruption the search for anomalous
regions must be made in a circle with a radius not less than triple the error
in determining the coordinates of the eruption in a parallel network of runs
with a distance between profiles not greater than the anticipated size of the
feature, with the closeness of the runs increasing toward the center of the
circle. In planning a system of runs for the purpose of detailed study of an
underwater volcano the minimum extent of field nonuniformities satisfactorily
retrievable on the basis of survey results cannot be less than 16^X the error
in determining the coordinates of the research ship. The detailed study of
an underwater volcano must be made in an orthogonal uniform network of
measurement runs. Figures 5; references 15: 14 Russian, 1 Western.

EDDY-RESOLVING MODEL OF NORTH ATLANTIC CURRENTS

[Article by D.G. Seidov, A.D. Marushkevich and D.A. Nechayev, Oceanology
Institute, USSR Academy of Sciences, Moscow]

[Abstract] The fundamental climatic importance of synoptic eddies in the
ocean is that they redistribute heat and momentum and maintain the gradients
of geophysical oceanic fields in an accentuated state. Unfortunately, until
recently all the results of eddy-resolving numerical modeling have been
obtained using very idealized models with simple geometric and idealized
bottom relief, using models of rectangular basins with even bottom relief
and for dimensions considerably less than those of real ocean areas. This
has given rise to doubts concerning the applicability of the conclusions
drawn from such eddy-resolving models with respect to the significance of
synoptic variability in real oceanic circulation. This made it imperative
to formulate an eddy-resolving model of some real oceanic area for clarifying
the applicability of the conclusions drawn from idealized research to study
of synoptic variability. A circulation model was proposed for this purpose

(presented here in abbreviated form, given in complete detail in IZV. AN SSSR: FAO, Vol 16, No 1, p 73). This model has now been used to obtain preliminary results of computations of hydrophysical fields in the North Atlantic with allowance for their synoptic variability. The model proposed earlier is reduced to solution of three prognostic equations for evolution of the fields of temperature, salinity and relative vorticity of total flows. Model prognostic experiments were carried out for simulating currents in a limited region to the west of the mid-oceanic ridge, followed by diagnostic and prognostic experiments for the entire North Atlantic. Two such diagnostic experiments are described. The results are indicative of the importance of synoptic variability in the structure and dynamics of macroscale hydrophysical fields in the ocean. Figures 2; references 7: 5 Russian, 2 Western.

MORPHOMETRIC STUDIES OF WORLD OCEAN

[Article by K.A. Zvonarev (deceased) and Ye.G. Kapralov]

[Abstract] The literature on morphometric studies of the world ocean is reviewed, with emphasis on the work of E. Kossina, M. Groll, O. Krümmel, H.W. Menard and S.M. Smith. The most recent data indicate that about 16% of the area of the ocean has been studied to such a degree that bottom relief forms can be mapped precisely, another 22% is mappable only with the principal relief forms, whereas the remaining area has been studied only very approximately. Many significant contributions to morphometric study of the ocean have been made during the last decade by specialists at Leningrad State University, Moscow State University and the Oceanology Institute, but also by many other Soviet and foreign authors and organizations. Unfortunately, all these studies have been made using different methods and with unlike accuracy. Table 3 is a list of these publications. As the degree of study of the ocean floor increases and its shoreline is plotted more precisely there has been an increase in the number of the principal quantitative characteristics used in describing relief of the ocean floor. More and more studies are appearing which give the statistical characteristics of relief, the indices of vertical and horizontal dissection and orientation of the bottom surface, as well as shoreline length and sinuosity, but most are limited to small areas and the range of initial data used is extremely small. This review of the outdated literature, and the more recent publications as well, clearly shows that there is an insistent need for a standardized method for determining the morphometric characteristics of the world ocean. References 39: 32 Russian, 7 Western.

PROBABILISTIC ANALOGUE OF DETERMINISTIC 'PREDATOR-PREY' MODEL IN EXAMPLE OF
INTERACTION AMONG PLANKTON POPULATIONS

[Article by A.V. Grigoryev]

[Abstract] The formulation of mathematical models for the study of plankton
populations is carried out in one of two directions corresponding to the
concept of a causal nature of the postulated mechanism: deterministic or
probabilistic. The author proposes derivation of a probabilistic analogue, a
model which is completely similar to the Volterra deterministic "predator-
prey" model. It is based on expressions for the λ_i and μ_i probability
densities for birth and death of individuals in an i-th population. The
formulation of such an analogue is based on a number of axiomatic assumptions.
This is illustrated in a coenosis consisting of two interacting populations,
one of which is the "prey," whereas the other is the "predator." The indi-
viduals of the biocoenosis can be divided into two subgroups in such a way
that interaction occurs only between representatives of different groups,
whereas individuals belonging to one subgroup are indifferent to one another
even if they belong to different populations. Such a case is a biocoenosis
consisting of two populations, phyto- and zooplankton, where the latter is
the "predator" relative to only a definite part of the phytoplankton, remain-
ing indifferent to the other part. References: 2 Russian.

ROLE OF OCEAN IN ABSORPTION OF ANTHROPOGENICALLY FORMED CO_2 FROM ATMOSPHERE

[Article by V.G. Gorshkov, Leningrad]

[Abstract] A considerable quantity of the carbon discharged into the atmos-
phere due to man's activity is subsequently absorbed in the ocean. After an
analysis of the absorption of atmospheric CO_2 by the ocean through the inter-
face, the physicochemical absorption of carbon by the ocean and the biogenous
absorption of carbon by the ocean, as well as the distribution of differences
in CO_2 concentration in the ocean, it is shown that CO_2 absorption by the
ocean is dependent on the difference $\Delta[CO_2]$ in atmospheric $[CO_2]_a$ and oceanic
$[CO_2]$ concentrations. The mean global $[CO_2]_a$ value is known with an accuracy
to a few percent due to intensive mixing of the atmosphere. Moreover, the

local $[CO_2]$ values are measured in the ocean with an accuracy equal to that in the atmosphere. The $\Delta[CO_2]$ difference varies in space and time with a change in sign and in absolute value this exceeds the $\delta[CO_2]_a$ increment in the atmosphere relative to the preindustrial era. CO_2 absorption by the ocean can be expressed only through the atmospheric CO_2 increment $\delta[CO_2]_a$. Carbon absorption is determined by three factors: passage through the interface R_{am}, absorption in inorganic form R_d and absorption in organic form R_p. Due to possible reaction of oceanic biota CO_2 absorption by the ocean can increase by several times in comparison with computed carbon absorption by the ocean in inorganic form. The observed values $R_{p\ min} \ll R_{am}$ indicate that biogenous absorption of CO_2 by the ocean can attain a maximum admissible physical limit determined by transmissivity of the ocean-atmosphere interface. The rate of biological absorption by the ocean exceeds physicochemical pure absorption by the ocean by approximately an order of magnitude. Figures 1; references 35: 8 Russian, 27 Western.

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EVOLUTION OF SEAMOUNT LANDSCAPES

[Article by V.V. Fedorov, Moscow]

[Abstract] In the course of evolution of volcanic structures in the ocean there is a change in their landscape in general, not only their relief. Eleven different types of evolution of bottom landscapes of volcanic mountains in the ocean are discussed (Figure 1 is a diagram of seven of these). A number of common features are noted in the development of bottom landscapes in the ascending and descending stages of relief development. In the stage of ascending development of relief of underwater volcanic forms the landscape structure is complicated and the bottom landscapes become more diversified. As an underwater volcano grows the primitive volcanic landscapes of hills are enriched by facies of pelagic sediments and locally by well-developed trophic groupings of detritus-eating invertebrates. As volcanoes rise into the photic zone the development of landscapes in the tropics and in the extratropical areas of the ocean transpires along divergent lines. Radical differences in the bottom landscapes of tropical and nontropical mountains are attributable to the specifics of coral lithomorphogenesis and the formation of coral reefs. In the stage of descending development the landscapes of tropical and extra-tropical mountains develop along convergent lines. The differences between them diminish, persisting only in the lithogenic base. The range of morphological components of bottom landscapes is reduced. In the course of evolution of landscapes of volcanic structures all components of bottom landscapes experience changes. The evolution of volcanic islands, coral atolls and seamounts cannot be fully understood if they are examined independently of one another. Figures 3; references 22: 11 Russian, 11 Western.

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NUMERICAL MODELING OF SEASONAL VARIABILITY OF WORLD OCEAN

[Article by V.I. Klimok, V.P. Kochergin and G. Fridrikh, Computation Center,
Siberian Department, USSR Academy of Sciences]

[Abstract] The seasonal variability of the world ocean was computed by
numerical integration of the full nonlinear equations of hydrothermodynamcis.
Conservative difference schemes are used in the process, allowance being made
for the upper quasi-homogeneous layer and real bottom relief. The computations
were made for the area of the world ocean from 67.5°N to 65.5°S using a 5° grid
in horizontal coordinates and a nonuniform vertical grid to a depth of 1,000 m
(12 levels) and from 1,000 to 5,000 m with a uniform grid (8 levels) with a
500-m interval. A numerical experiment was carried out in three stages on
the assumption that the minimum depth was not less than 450 m and the maximum
depth was not greater than 5,250 m. The first stage began with the ocean at
a state of rest and with a climatic distribution of the temperature field for
September; computations for this variant were made for 11 years model time.
The second stage involved solution of the seasonal variability problem using
data taken from solution of the first stage; the nonstationary problem was
calculated for 20 years. In these two stages it was assumed that ocean depth
is constant. In the third stage seasonal variation was determined with
allowance for real bottom relief; computations were made for 20 years model
time using the initial field obtained in the second stage. Nonlinear terms
were taken into account. The model revealed that the seasonal evolution of
depth of the turbulent layer corresponds to the change in season of the year.
The depth of the mixed layer is tens of meters in summer and in winter locally
reaches the bottom. The earliest onset of convection and its latest end are
observed in the region of the westerly boundary currents in the northern
hemisphere; in the southern hemisphere the corresponding region is that of
the Antarctic Circumpolar Current (these are the regions of maximum variability
of heat content in the ocean). The decrease in heat content during winter is
associated with the process of convective cooling, resulting in the formation
of extremal heat flows from the ocean into the atmosphere. In these regions
the heat content increases during the period of ocean heating due to advective
processes. The model computations show that the simulated hydrothermodynamic
characteristics are entirely consistent with prevailing concepts. The model
gives the correct seasonal variations in heat transport across the equator
and can be used in more detailed study of the mechanisms of heat transport by
ocean currents, assuming improvement in horizontal resolution. Figures 4;
references 18: 12 Russian, 6 Western.

INFLUENCE OF WAVE DISPERSION ON DIRECTED TSUNAMI PROPAGATION

[Article by B.I. Sebekin, Oceanology Institute, USSR Academy of Sciences]

[Abstract] In an earlier study (A.N. Lebedev, et al., "Generation of a
Directed Tsunami Wave in the Coastal Zone," IZV. AN SSSR: FAO, Vol 18, No 4,
pp 399-407, 1982), a hydrostatic approximation was used in studying this
phenomenon.   However, the examination was deficient in failure to make full
allowance for dispersion effects. The assumption is made that the radiation
will be acutely directed if at distances much greater than the scale of the
region of imparting of perturbation some wave phase, such as the leading
edge, propagating from the focus of tsunami generation, attenuates in con-
formity to different laws as a function of azimuth of the observation point.
An analysis of the propagation of such dispersing waves for a basin with a
linear shoreline reveals that such waves are generated by a perturbing force
limited in time and space. In the region of directed radiation the leading
edge of a tsunami attenuates as $r^{-1/3}$ when $r \to \infty$ (r is dimensionless
distance). Behind the leading edge the wave amplitude attenuates as $r^{-1/2}$,
and in the side zones as r^{-1}. If a tsunamigenic earthquake occurs in a
coastal zone and an abrupt oceanward displacement of an island arc projection
imparts momentum to water masses in the horizontal plane this will give rise
to a tsunami wave which is acutely directed in the distant zone. As revealed
by comparison with the earlier study, allowance for dispersion causes a sub-
stantial change in head wave configuration and the law of its amplitude
attenuation. References: 10 Russian.

ANALYSIS OF SERIES OF CONVECTIVE STEPS IN TEMPERATURE INVERSION IN SEA

[Article by K.N. Fedorov, V.T. Paka, G.R. Gamsakhurdiya and M.V. Yemelyanov,
Oceanology Institute, USSR Academy of Sciences]

[Abstract] A distinct stepped structure in the temperature inversion layer
was discovered in the Ionian Sea to the south of the Peloponnesus in October
1983 during cruise 6a of the "Akademik Kurchatov." This stepped structure
consisted of 20 mixed convective layers with thicknesses from 1.5 to 8.2 m
in the layer 210-310 m. This inversion layer was situated between relatively

freshened and cold waters with a minimum temperature 14.57°C at 210 m and a minimum salinity of 38.60°/oo at 160 m and warmer and more saline waters with a maximum temperature of 14.80°C at the horizon 310 m and a maximum salinity of 38.78°/oo at 410 m. It was determined that this stepped inversion layer stratification is attributable to a meandering front of a thermoclinal character. A detailed study was made of the conditions for its formation and the resulting heat and mass exchange through the corresponding layers. The characteristics of the steps were thoroughly studied with respect to the vertical distribution of temperature, salinity and density. These data were compared with the results of corresponding laboratory experiments. This made possible a more thorough comprehension of the mechanism of this phenomenon than was available earlier. The vertical flows of heat and salt and the corresponding virtual coefficients of the exchange of heat and salt through the convective layers and high-gradient interlayers are tabulated for this particular event. Figures 4; references 14: 7 Russian, 7 Western.

FAULTS IN NORTHERN PART OF CENTRAL ATLANTIC

[Article by A.O. Mazarovich, Geology Institute, USSR Academy of Sciences, Moscow]

[Abstract] In the northern part of the Central Atlantic faults penetrate to depths as great as 11-16 km (Fig. 1 is a map of these faults at 1:10,000,000). Within this region the crust is broken by numerous faults in several systems oriented in different directions. One system is made up of giant sublatitudinal faults intersecting all the structural zones of the present-day Atlantic. They are characterized by a complex morphology and are of different age along the strike. Individual chains of volcanoes are associated with this system and vary in age. The distribution of heat flow and present-day earthquake epicenters indicates their activity both within the limits of the mid-oceanic ridge and in abyssal basins. Another system is formed of numerous faults associated with longitudinal structures of the mid-oceanic ridge. Its relationship to the first system indicates that during the course of Atlantic Ocean development there was activation along one and then along the other. A third system is made up of fault dislocations which developed only in thalassogens. The different morphology of the structures and their orientation are indicative of a great nonuniformity of the crust in abyssal basins. Still another system developed within the passive continental margins of the Atlantic Ocean. A fifth system is bordered by a zone of fault structures genetically associated with oceanogenesis processes. Deformations formed during horizontal tectonic stratification of the oceanic lithosphere at different levels constitute a special system. All this indicates a great mobility of the crust and

deeper horizons, contradicting the idea that there is a great rigidity and monolithicity of lithospheric plates. These systems are formed of tectonic dislocations of different extent, depth and kinematic characteristics. They are characterized by vertical movements of different amplitude and rate, shears and overthrusts. The diversity of types of dislocations resulted from complex geodynamic processes, including strong and nonuniform compression in different parts of the ocean. Figures 1; references 30: 11 Russian, 19 Western.

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CSO: 1865/30

RESEARCH ON MICROSTRUCTURE OF OCEANIC HYDROPHYSICAL FIELDS (FORTY-SECOND CRUISE OF SCIENTIFIC RESEARCH SHIP 'AKADEMIK KURCHATOV')

[Article by R.V. Ozmidov, doctor of physical and mathematical sciences]

[Abstract] The 42d cruise of the "Akademik Kurchatov" took place during the period August-October 1985 in zones of contact of waters of significantly different thermohaline properties (contact of warm and saline waters of North Atlantic origin and cold and less saline waters of arctic seas, and zone of contact between Mediterranean and Atlantic waters to the west of the Strait of Gibraltar). The objective was a study of the fine structure of hydrophysical fields and small-scale turbulence, transformation of vertical fine-structured profiles and characteristics of turbulence in zones of sharp dropoffs in depths, small-scale structure of bottom boundary layer of the ocean in its shallow regions and fine structure of the upper ocean layer near the edge of floating ice. The work was done in five work ranges: Norwegian and Greenland Seas, boundary between the Barents and Norwegian Seas and to the west of the Strait of Gibraltar. A total of 123 stations were occupied; current velocities were measured at 108 horizons, the waters were sounded 581 times using instruments of different types; instruments were towed for 720 hours. Internal waves were registered for 130 hours and surface waves were measured at 7 points. The distinctive characteristics of each work range are described. Statistical determinations of fine structures in the different areas made it possible to ascertain their dependence on the mechanisms of generation of structure and on mean hydrological conditions. It was found that the stratification parameter was of greater importance in frontal zones and of lesser importance under thermodynamically quiet conditions. The intensity of turbulent temperature fluctuations in zones of mixing of waters of different origin was considerably greater than in the open ocean. When wind waves are present the upper mixed layer of the ocean is always turbulent. At greater depths turbulence is present in the form of individual spots which are first generated and then dissipate. Turbulent layers were virtually always discovered in the bottom layer in shallow-water regions where measurements could be made to the bottom. The number of turbulent spots in the water layer increases in the frontal zones and correlates well with an increase in

the stratification parameter. In shallow-water regions the bottom turbulent layer is frequently in contact with the surface layer, forming a continuously turbulent layer but with an intensity changing with depth and in time. In the zone of floating ice turbulence in the upper layer of the ocean can be caused not only by wind waves, but also by local convective movements due to melting of the ice and movements in swell waves. The expedition results will provide a basis for proposing new methods for the parameterization of small-scale processes in models of general circulation of the ocean and in models of the behavior of different kinds of impurities in the sea. Figures 4.

REACTION OF OCEAN UPPER LAYER TO PASSAGE OF HURRICANE 'ELOISE'

[Article by Kh.Zh. Dikinov, A.S. Ksenofontov and L.A. Moskalenko, Kabardino-Balkar State University, Nalchik]

[Abstract] The reaction of the upper layer of the ocean to passage of hurricane "Eloise" was reproduced using a one-dimensional dynamic model closed by nonstationary dynamic turbulence equations using measurements made on a buoy in the Gulf of Mexico. Computations of evolution of the upper layer during "Eloise" were made using data on wind velocity and direction, resultant heat flow from the atmosphere into the ocean and the initial vertical temperature distribution. It was revealed that the vertical turbulent structure is determined by the energy of turbulence and the rate of viscous dissipation. An analysis of the overall pattern of behavior of turbulent characteristics during the storm indicated that wind stress was the principal source of their changes. Upper layer turbulence was determined by the collapse of surface waves and drift current velocity shear. The maxima of energy of turbulence and rate of viscous dissipation corresponded to the wind maximum. The turbulent structure of the upper layer before and after passage of the storm was quite different. In the storm track turbulence was greatly influenced by heat flows at the ocean surface which during periods of heating result in an increase in the hydrodynamic stability of water masses and a repeated decrease in turbulence characteristics in the upper layer. During nighttime cooling of the ocean surface a quite deep layer of positive temperature gradients is formed resulting in a rapid restoration of turbulence characteristics. The coefficients of turbulent viscosity and thermal diffusivity are particularly subject to diurnal variation. Figures 2; references 11: 9 Russian, 2 Western.

ASYMPTOTICS OF SURFACE WAVES CAPTURED BY SHORES AND BOTTOM RELIEF
NONUNIFORMITIES

[Article by S.Yu. Dobrokhotov, Moscow Civil Engineering Institute imeni
V.V. Kuybyshev]

[Abstract] The problem of trapped waves on the surface of an ideal eddy-free
fluid has been well studied for a case when the initial system of equations
allows separation of variables. This is applicable to waves intersected by a
straight shoreline. Waves intercepted by bottom relief nonuniformities have
also been well studied. Much less attention has been given to cases when
basin depth is not constant and the variables are not separable. A precise
solution or any approximation to it is scarcely possible in a general
analytical formulation. In this article it is shown that when there is some
small or large parameter in the problem a solution can be obtained by
asymptotic methods. The parameter characterizing smoothness of bottom
relief change in definite directions is such a natural small parameter in
problems relating to surface waves. On the assumption of slowness in depth
change, new formal asymptotic solutions are obtained, localized in the
neighborhood of shorelines, and solutions localized in the neighborhood of
some curves determined by the geometry of underwater shoals, crests or island
shelves. These cases are examined separately in detail. References 9:
7 Russian, 2 Western.

DYNAMICS OF ACCUMULATION OF ORGANIC MATTER IN SEDIMENTARY LAYER OF SEAS AND
VARIATIONS IN RATE OF PLATE MOVEMENT

[Article by V.P. Aparin and V.Ya. Trotsyuk, Physics Institute imeni L.V.
Kirenskiy, Siberian Department, USSR Academy of Sciences, Krasnoyarsk,
Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] The distribution of organic matter in time and space is an
important aspect of geochemistry and petroleum geology. The distribution of
zones of different concentrations of organic matter over the area of the
oceans and continents is largely determined by geomorphology, distribution
of facies and biocoenoses, but the nature of age variations of organic matter
subclarkes and the global nature of these variations have remained quite

unclear. An effort has been made to explain these phenomena using the theory of plate tectonics. An examination of the dynamics of changes in the content of organic matter in stratigraphic elements of the oceanic sedimentary layer has revealed a discrepancy in the subclarkes of C_{org} characterizing the sedimentary section of recent internal and peripheral regions of the ocean which increases from the Cretaceous to the Quaternary. This fact is logically interpreted as a result of the geodynamics of plates, processes of spreading of the floor of "young" oceans resulting in an intensification of the contrasts of fossilization of C_{org} near and far beyond the limits of the continental margins. It appears that the rate of fossilization of C_{org} is related to the rate of ocean floor spreading. During a period of accelerated spreading in the marginal basins of the Atlantic there was an increase in the rate of sedimentation due to plunging of the crust and the transgression which developed due to more intensive growth of mid-oceanic ridges. Since the change in rate affects the group of lithospheric plates entrained into motion through the general system of spreading axes, the processes of vertical crustal movements in this system almost simultaneously experience the effect of variations in the rate of continental drift. This gave rise to the global component of sedimentogenesis and C_{org} accumulation which is regulated through a complex of tectonic conditions. The rhythm of variations in the rate of plate movement is therefore transformed into a periodicity of variations in C_{org} content in oceanic sections. This is confirmed by a comparison of the curves of plate movement and curves of the rate of sedimentation for the end of the Cretaceous and Cenozoic, averaged for individual oceans and the entire oceanic sedimentary layer. In addition, changes in geochemical conditions were still another "lever" by means of which variations in the rate of plate movements could control the dynamics of accumulation of organic matter and fuels in the oceans (and on the continents as well). Figures 2; references 12: 7 Russian, 5 Western.

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VISCOUS FLOW OF SEDIMENTS ON FLOOR OF ABYSSAL BASINS

[Article by N.V. Yesin and A.Ye. Shlezinger, Southern Division, Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Gelendzhik; Geology Institute, USSR Academy of Sciences, Moscow]

[Abstract] Abyssal basins are filled primarily by a lateral flow of sediments. For many hundreds of kilometers their layers are very gently sloping, almost horizontal, sloping toward basin bottom relief irregularities. In earlier studies (K.M. Shimkus and A.Ye. Shlezinger, LITOL. I POLEZ. ISKOP., No 1, pp 105-116, 1984, and elsewhere) it was postulated that formation of the layers of the lateral complex is governed by a gravitational movement of sediments

similar to the flow of a viscous fluid. A viscous or viscoplastic fluid can flow along a horizontal plane provided that its free surface slants toward the plane of the horizon. Sediments flowing as a viscous fluid give rise to horizontal layers. Sloping layers are formed during the movement of sediments as a viscoplastic fluid. The most objective way to study the movement of a viscous fluid is by use of the Navier-Stokes equation with representation of the slow flow of sediments along a horizontal or slightly inclined plane as a steady plane-parallel movement of a viscous fluid. An equation is derived for determining the thickness of the sediment $h(x)$ as a function of its volume Q, bottom slope and the h_0 value. It is shown that in the direction of movement the thickness of the moving sediment should decrease. This is illustrated in the case of movement of terrigenous material into the abyssal part of the Black Sea (the bottom slopes of its abyssal basin are minutes to several degrees and the thickness of the moving sediment is 5-10 cm). The rate of movement of sediments under the influence of gravity can be estimated if their viscosity and thickness are measured reliably. Figures 1; references 7: 5 Russian, 2 Western.

LODGING OF BODIES DURING INTERACTION WITH CLAYEY SEDIMENT AT HYDROSTATIC PRESSURE

[Article by N.V. Cherskiy, academician, V.I. Ivannikov and L.P. Mikhlin, Aprelevo Division, All-Union Petroleum Geological Prospecting Scientific Research Institute]

[Abstract]   One serious problem in the drilling of deep and superdeep bore-holes is the lodging of pipes, which accounts for about 30% of all work stoppage. No adequate physical model of this phenomenon has been formulated, although much research has been done during the last 30 years. Most Soviet and foreign specialists feel that this lodging is attributable to the effect of the pressure drop existing between the borehole and the penetrated stratum.   In this article it is shown that this hypothesis is untenable. A fundamentally new concept of the mechanism of lodging of pipes in boreholes is proposed (the findings are applicable to the sitting of a submarine on a clayey bottom). The proposed mechanism is based on a thorough analysis of change in the thermodynamic state of water in the zone of contact between clayey particles and a metal surface, with close attention to the behavior of solidly bound water, free water and metal cations. It is shown that with consolidation of clayey ground with bound water in the coagulation contacts of solid-phase particles with one another and with a metal surface the bound water acquires the ordered crystalline structure of ice. Solidly bound water virtually does not transmit hydrostatic pressure. An expression is

derived for determining the lodging force under specific conditions. Concepts
and data presented in the article make it possible to explain cases when the
lodging forces at great depths attain values 0.1-0.5 MH and increase with
duration of fixed contact of pipes with the clayey crust on borehole walls.
Figures 2; references: 8 Russian.

STATE-OF-ART AND PROSPECTS FOR DEVELOPING EQUIPMENT FOR MEASURING HYDROLOGICAL
PARAMETERS IN WORLD OCEAN

[Article by T.K. Izmailov, doctor of technical sciences, A.M. Izmaylov and
F.M. Allakhverdov, candidates of technical sciences]

[Abstract] A review of the present status of production of instrumentation
for measuring hydrological parameters in the world ocean reveals numerous
deficiencies which are inconsistent with effective oceanological research on
a global scale, which are economically unjustifiable and make difficult
comparison of research carried out by different organizations. It is proposed
that much of the nonstandardized equipment be replaced by a standardized
series of precise ultrasonic hydrological instruments which can be employed
in measuring the most important hydrological parameters of the ocean. The
ultrasonic measurement method is not yet widely employed in producing hydro-
logical instruments largely due to a bias toward traditional methods,
inadequate knowledge of ultrasonic principles among oceanologists, difficulty
in designing the required piezoelectric transducers for ultrasonic oscilla-
tions ensuring absence of acoustic noise, with high reliability and long
lifetime, long-persisting lack of suitable integrated microcircuits, and lack
of piezoelectric transducers with the required geometrical configurations,
size, acoustical and electrical properties. Many of these problems have been
resolved or are being rectified. The possibilities of such instrumentation
are exemplified by an ultrasonic frequency-time transducer for the velocity
of propagation of sonic oscillations, as well as ultrasonic frequency-time
devices for measuring hydrological parameters and use in navigation which are
described in detail in the article. Figures 4; references: 13 Russian.

PALEOGEOTHERMS AND MANTLE PLUMES

[Article by V.V. Slavinskiy, ILSAN, Moscow]

[Abstract] Two barometers were proposed for computing the pressure of garnet-orthopyroxene equilibrium (V.V. Slavinskiy, VOPROSY METAMORFIZMA DOKEMBRIYA, Apacity, pp 87-104, 1980). This served as a basis for developing a garnet-dipyroxene thermobarometry method which can be used in determining geothermal gradients, thickness of the lithosphere and surface heat flows for continental and oceanic regions during the eruption of xenoliths from kimberlite pipes and volcanoes. An analysis was made of conductive geotherms in Lesotho, South Africa and Namibia, the Colorado Plateau, Hawaiian Islands and the Ontong Java Plateau in the Pacific Ocean and a convective geotherm of the Siberian plate in the neighborhood of the Udachnaya kimberlite pipe in Yakutia. Thickness of the lithosphere and the surface heat flow were also estimated for these regions. A conductive geotherm with a sharp curvature near the base of the thermally thinned lithosphere is attributable to movement of a lithospheric plate with a stationary thermal regime, whereas a convective geotherm without curvature is attributable to a disturbed thermal regime over a mantle plume during the time of volcanism. Such a disturbance is evidently a result of passage of the lithosphere over a plume in the epoch preceding volcanism. The results of the thermobarometric measurements described in the article indicate that there is a relationship between continental and oceanic intra-plate volcanism and mantle plumes. Figures 4; references 49: 14 Russian, 35 Western.

VISCOUS DRAG OF OCEANIC LITHOSPHERE

[Article by V.P. Trubitsyn and A.S. Fradkov, Earth Physics Institute imeni O.Yu. Shmidt, USSR Academy of Sciences]

[Abstract] A study was made of the structure of thermal convection under the moving lithosphere in the subduction process. The mechanical interaction of flows with the lithosphere is modeled using a stipulated rate of horizontal movement at the upper boundary of the viscous mantle and vertical velocity at the side walls. This is followed by a determination of convection rates and temperatures in the upper mantle and distribution of viscous cohesion forces

for different intensities of convection, rate of lithosphere movement and subduction depth. On this basis it was possible to find the critical rates of movement of the oceanic lithosphere at which the convection currents in the upper mantle are restructured. Emphasis is on the range of rates of lithospheric movement less than the characteristic velocity of viscous flows, corresponding to a case when the lithospheric plate experiences drag due to interaction with adjacent plates and the less active continental mantle. The coehsion between the moving lithosphere and viscous mantle results in a broadening of convective eddies rotating in the direction of movement of the lithosphere and the suppression of countereddies. With an increase in the rate of lithospheric movement the eddies are joined together, forming a single eddy beneath the entire lithospheric plate. Heat exchange between the cold subsiding lithosphere and the viscous mantle results in a broadening of the contacting eddy and a decrease in the rate of lithospheric movement by 10-20%. Allowance for mass exchange between the thickening horizontal part of the plate and the vertical part sinking into the mantle results in an additional (approximately 15%) decrease in the rate of lithospheric movement. Figures 5; references 22: 7 Russian, 15 Western.

GEOLOGICAL AND GEOPHYSICAL COROLLARIES OF OCEANIC LITHOSPHERE SERPENTINIZATION

[Article by L.I. Lobkovskiy, V.N. Nikolayevskiy and A.V. Karakin, Oceanology Institute, USSR Academy of Sciences; Earth Physics Institute, USSR Academy of Sciences, Moscow]

[Abstract] A two-level model of structure of the 3d oceanic layer, based on the modified Hess hypothesis, supplemented by modern concepts on formation of the 2d (basaltic) and upper part of the 3d (gabbro) layers of the oceanic crust in the axial spreading zone, appears to be logically rigorous and best supported by observational data. However, it requires quantitative validation and an explanation of the fact that the thickness of the 3d layer on the average increases by only 2-3 km, whereas the 500°C isotherm drops by a depth of about 30-40 km over the course of ~ 100 million years. Figure 1 is a diagram of formation of the lithosphere and layers of the oceanic crust in the spreading prcoess: This serves as a basis for an integrated review of the recent literature. The unusual distribution of foci of intermediate earthquakes (in the depth range from 50 to 250 km) beneath island arcs is associated with the process of deep serpentinization of a plunging lithospheric plate. In a number of island arcs the hypocenters of intermediate earthquakes have a tendency to be arranged in the form of two parallel focal surfaces, one of which coincides with the surface of the plunging plate, whereas the other runs

approximately in the middle of the plate and is 30-40 km from the first.
Whereas the focal mechanisms of the upper focal surface correspond to com-
pression oriented in the direction of plate plunging, the focal mechanisms of
earthquakes at the lower surface correspond to dilatation in this same direc-
tion. Although existing models of a plunging plate qualitatively explain the
focal mechanisms of intermediate earthquakes, they cast no light on the reason
for stratification of the Wadati-Zavaritskiy-Benioff zone at two parallel
surfaces. The concept of intensive serpentinization of the lithosphere can be
applied in explaining the development of the double focal zone. (Figure 3 is
a diagram explaining the mechanism for formation of the double focal zone in
the subduction zone in relation to intense serpentinization.) Another of the
corollaries of serpentinization of the oceanic lithosphere is an explanation
for the observed changes in amplitude and form of magnetic anomalies with a
transition from the slopes of the mid-oceanic ridges to basins. Numerical
estimates show that a 2- to 3-km layer of serpentinites with the experimentally
determined magnetization can easily explain the observed strength of magnetic
anomalies in oceanic basins. Figures 3; references 36: 11 Russian, 25 Western.

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TECTONICS OF SEDIMENTARY LAYER IN WESTERN PART OF BARENTS SEA

[Article by K.A. Klitin, Geology Institute, USSR Academy of Sciences, Moscow]

[Abstract] During recent years Norwegian, West German, American and Soviet
researchers have accumulated much new information concerning the floor of the
southwestern part of the Barents Sea. At the western margin of the sea there
is a major (350 x 800 km) structure known as the Nordkap [North Cape] downwarp
which is situated between the Baltic shield and the Norwegian caledonides on
the south and the uplifted part of the Spitzbergen Platform (plate) on the
north (all pertinent structural elements are shown in Fig. 1, a tectonic map
of the studied area). All published materials were used in an integrated
description of structure of the platform cover of Spitzbergen Archipelago and
Northern Scandinavia, the sedimentary cover of the floor in the western part
of the Barents Sea and the tectonic development of the region and the formation
of structures. The Nordkap downwarp is filled with Middle- to Upper-Paleozoic
and Mesozoic deposits attaining a thickness of 8-12 km. This downwarp is a
long-developing structure (extending over a period of 250 million years) whose
formation began in the Devonian and ended in the Cretaceous. There are
unconformities and gaps between its four complexes. The downwarp is broken
by faults between which troughs and rises were formed. Individual structures
developed cosedimentationally with the key role being played by faults. A
system of grabenlike troughs with salt dome structures, extending for a

distance of 700 km, was formed along the entire downwarp in pre-Permian times. Longitudinal structures of the Cenozoic West-Barents perioceanic downwarp, filled with Cenozoic deposits, were superposed along a major fault in the western part of the Nordkap downwarp during the Paleogene. Figures 4; references 24: 12 Russian, 12 Western.

DESCRIPTION OF NORTH ATLANTIC BASEMENT

[Article by N.Ya. Kunin and S.V. Usenko, Earth Physics Institute imeni O.Yu. Shmidt, USSR Academy of Sciences]

[Abstract] The discrimination of the basement surface is essential for a comparative study of structure of the continental and oceanic crust. Different authors have applied different criteria in defining the Atlantic Ocean basement, but none can be regarded as satisfactory. The most satisfactory choice seems to be the top of the third oceanic layer because it can be detected quite reliably on the basis of seismic data and is underlain by the Moho. Between the basement surface and the Moho there is a relatively uniform magma-metamorphic crust which has experienced intense dislocations. In the North Atlantic there have been more than 400 deep seismic soundings which provide data on the seismic section to the M discontinuity, in all cases with discrimination of the third layer. (Figure 1 shows the location of the soundings.) The article gives the results of analysis of lateral changes in thickness and boundary velocity of the North Atlantic basement using materials updated to mid-1983. Histograms and maps of the analyzed parameters were prepared for individual geomorphological structures, for the ocean floor, for the western and eastern transition zones and for the North Atlantic as a whole. (Figure 2 illustrates histograms of distribution of the magma-metamorphic crust; Fig. 3 is a map of thickness of the magma-metamorphic crust; Fig. 4 shows histograms of boundary velocity distribution along the basement surface.) Within the limits of the continental margins there is a narrow range of thickness of the magma-metamorphic curst which can be interpreted as the zone of sharp transition from the continent to the ocean. Most importantly, all the presented data fail to indicate presence of any bilateral symmetry in crustal structure, which is an indispensable condition for the spreading hypothesis. Figures 5; references 39: 14 Russian, 25 Western.

SELECTION OF GRANULOMETRIC CLASSIFICATION FOR GEOLOGICAL SURVEY OF SHELF

[Article by R.I. Goloudin and I.A. Kuryanova, All-Union Geology Scientific Research Institute]

[Abstract] An attempt was made to use a lithologic classification for geo-logical survey work in a bay along the coast of the Sea of Japan. The floor of the bay was mapped at 1:25,000 and the results of preliminary visual documentation were used to note fields of development of sands, clayey aleurites and aleuroclays. Sediment particle size was found to decrease with increasing depth. Analyzing the particle-size distribution, the authors concluded that the classification method endorsed by the Oceanology Institute, USSR Academy of Sciences, based on a 10-point scale of particle sizes, is best for use in shelf surveys. The disadvantage of this classification is that it is based entirely on the particle size of the dominant sediment, whereas it is possible to find distinctly different sediment types with the same dominant particle size. It is impossible to distinguish mixed sediments by this method. A system of notations on maps is suggested to avoid this difficulty.

EVOLUTION OF INDIVIDUAL EDDIES IN ROTATING FLUID

[Article by G.G. Sutyrin and I.G. Yushina, Moscow]

[Abstract] A numerical study of the evolution of cyclones and anticyclones with characteristic scales significantly greater than the deformation radius is presented. An equation is used which is derived by an asymptotic method. The model ensures conservation of potential vorticity in fluid particles for movements of finite amplitude. It is shown that anticyclones of a certain type characteristically have a steady form and move westward. It is found that the existence of steadily moving anticyclones requires the presence of an area of closed potential vorticity isolines, called a capture area, in which the liquid moves together with the anticyclone. Cyclones move westward more slowly than anticyclones and move toward the poles, losing energy to Rossby waves. In the capture area, cyclones retain a near-circular form and attenuation of the eddy as a result of radiation of waves slows with an increase in its initial intensity. Figures 3; references 20: 11 Russian, 9 Western.

METHODS FOR DETAILED GEOLOGICAL STUDY OF SEAMOUNTS

[Article by V.S. Yastrebov, doctor of technical sciences]

[Abstract] After reviewing the great advances made in recent years in the
field of underwater research, the use of these new methods is illustrated in
the study of a number of seamounts made aboard the "Vityaz" in the summer of
1984 in tectonically active regions of the Mediterranean Sea and in the
Azores-Gibraltar sector of the Atlantic Ocean: Vercelli and Vavilov seamounts
in the Tyrrhenian Sea and Ampere and Josephine seamounts in the Atlantic.
Geomorphological, geothermal and geomagnetic surveys were made, the peaks and
slopes were carefully inspected and sediments and bedrock were sampled.
Use was made of the "Argus" manned submersible, the "Zvuk" towed apparatus, a
diving bell [photographs of all these accompany the text], corers and dredges
of several types. The "Vityaz" worked together with the "Rift," from which
geophysical surveys, seismic and gravimetric research was carried out. Data
were obtained on regional differences in interaction between seamounts and
the lithospheric plates on which they are situated. Vercelli is nonmagnetic,
but the peak of Ampere is characterized by exceedingly strong positive and
negative magnetic field anomalies. A great volume of oriented rock samples
were taken by divers. Vercelli has a nonvolcanic origin, being a fragment of
a Cenozoic granitoid batholith, whereas Ampere reveals distinct volcanic
activity. Rock samples were collected using the "Argus" manipulator, which
can handle only loose rocks; bedrock samples can only be broken off by a
diver. The diving bell was effective as deep as 200 m. Visual observations
were made by divers and the "Argus" crew. Thousands of underwater photographs
were taken. Bathymetric and geomagnetic maps were prepared. Divers were
used only in those cases when other alternatives were impractical. The
results of such work are close to those obtained in detailed work on the land.
Figures 4; references: 1 Russian.

RESEARCH ON SEA OF JAPAN PHOSPHORITES

[Article by G.N. Baturin, doctor of geological and mineralogical sciences]

[Abstract] Phosphorites were not known in Far Eastern seas until recently.
Recent research by specialists aboard the research ship "Pervenets" has now
convinced marine geologists that phosphorites occur rather extensively on the
Sea of Japan floor. This mineral is greatly needed in the Far East for the

production of fertilizers. A special expedition on the "Dmitriy Mendeleyev" (35th cruise) was organized by the Oceanology Institute for exploration of phosphorite deposits in the Soviet economic zone of the Sea of Japan. [Figure 1 is a map showing where the research was conducted.] Sixty-six specialists from a number of institutes worked in 11 detachments emphasizing geology, geophysics, lithology, biostratigraphy, geochemicstry, phosphorite formation, seismology, gasometry, biology, mathematical processing of data and testing of equipment. The work was begun on the Yamato Rise with geophysical and geological surveys. Collected material included 59 dredged samples and 15 cores of bottom sediments. Six bottom seismological stations were occupied. Twenty-two samples of phosphate material were taken and 4,100 determinations of the content of elements in bottom sediments were made. In the northern part of the Yamato Rise a survey at 1:100,000 covered an area of about 3,000 km^2. Sedimentary layer structure was studied and the distribution of phosphorites was mapped. Two highly promising areas of phosphorite mineral deposits with areas of 170 and 30 km^2 were defined. Phosphate material was from 2 to 27% of the rock mass. Phosphorites were discovered at depths from 1,500 to 2,000 m at 14 research stations. The age of the phosphorites was determined as Late Miocene by a number of micropaleontological methods (Figure 3 is a map of the paleogeography of the Sea of Japan in the Late Miocene). Paleooceanological reconstructions have shown that phosphorites are associated with the shelves of a Late Miocene basin. In most of the phosphorite samples there are relicts of the structure of the diatomaceous ooze in which they were initially formed. These phosphorites were formed by the same mechanism as on the shelves of Namibia, Peru and Chile. It was possible to trace the phosphorus cycle from its circulation in sea water to the formation of a phosphorite deposit. Phosphorites have been found at more than 50 points on the floor of the Sea of Japan. The reserves are estimated at several hundred million tons. Figures 7; references: 1 Russian.

5303/13046
CSO: 1865/387

TYPES OF ORE-FORMING HYDROTHERMS IN PRESENT-DAY OCEAN

[Article by S.G. Krasnov, All-Union Scientific Research Institute of Geology and Mineral Resources of the Ocean, Leningrad]

[Abstract] A joint analysis is presented of a number of characteristics of subaerial and submarine hydrotherms. It is found that hydrotherms forming iron, copper, zinc and lead sulfide mineralization form a single series in terms of salinity and acidity, from acid volcanic waters to slightly acid highly mineralized brines. The extreme members of the series correspond to two types of hydrotherms related to the formation of polymetallic and iron sulfides, while the intermediate members are the ore-forming hydrotherms in

the ocean. Genetically varied ore-forming hydrotherms in the ocean can be combined with the hydrotherms of the continental areas forming polymetallic sulfide mineralization into a single series with regularly changing acidity and salinity, indicating the importance of these characteristics of solutions in determining their capacity for leaching and transferring ore components and the formation of hydrothermal-sedimentary sulfide ores. Figures 1; references 15: 7 Russian, 8 Western.

6508/13046
CSO: 1865/54

INFORMATIVE SIGNIFICANCE OF NATURAL CERENKOV RADIATION OF SEA WATER FOR DEEP-WATER ANIMALS

[Article by Yu.B. Baboshin, S.L. Lopatnikov and N.I. Popov, Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] Sea water contains natural sources of light, relativistic electrons formed upon decomposition of β- and γ- active nuclides such as ^{40}K, radiating Cerenkov photons. The purpose of this article is to show that the light created by these sources in the ocean is sufficient to allow deep-dwelling animals to recognize objects at close range. The quantum effectiveness of the eyes of deep-water animals with respect to the flux of Cerenkov photons is estimated. The lenses of deep-water animals have been found to be transparent to the ultraviolet light of Cerenkov radiation, and the binocular vision of many species decreases the threshold of detectable radiation. Many deep-water animals have unusually large eyes, and eyes with high levels of visual pigmentation. The natural Cerenkov radiation in the depths is considered an important source of radiation for many inhabitants. Figures 1; references 15: 9 Russian, 6 Western.

6508/13046
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RESONANCE PHENOMENA IN FLUID MEDIA

[Article by A.T. Lukyanov, V.M. Inyushin and A.P. Gorokhov]

[Abstract] Studies were made to detect the presence of a "memory" in fluid media. The experiments revealed that the effect of electromagnetic radiation on fluid media can be explained by the phenomenon of resonant response of the

system receiving the radiation. Studies were made on plant seeds and yeasts, accompanied by catalytic chemical reactions and several physical and chemical tests. Sorption of trypaflavine by seeds was studied with exposure of distilled water to laser radiation. It was found that the duration of pre-servation of acquired properties depends on wavelength. The shorter the wavelength, the greater the degree of attenuation of changes in the properties of the water, as reflected by trypaflavine sorption by seed cells. Similar results were obtained in a study of the dynamics of hemolysis of erythrocytes in a saline solution. Changes in biological and physicochemical activity in fluid media correlate with wavelength. A photograph shows the change in solubility of d-camphor in water first exposed to electromagnetic radiation at various wavelengths. Figures 1; references: 4 Russian.

6508/13046
CSO: 1865/396

'RAZREZY' ['SECTIONS'] SCIENTIFIC PROGRAM

[Article by A.S. Sarkisyan, corresponding member, USSR Academy of Sciences]

[Abstract] "Razrezy" ["Sections"] is a 5-year Soviet program, initiated in 1981 and extended for a second 5 years, to study the short-period fluctuations in the processes of energy exchange between the world ocean and the earth's atmosphere. Academician G.I. Marchuk heads this program. The ultimate goal is establishment of a scientific-methodological base for quantitative predic-tion of seasonal and annual climatic fluctuations, mainly by developing a model of the ocean-atmosphere system. To reduce the immense amount of data to be collected, theoretical results published by G.I. Marchuk have been applied. These show that only about 10 "energy-active zones" (EAZ) need be studied, since they are characterized by the most dynamic exchange of energy between the ocean and atmosphere. Five of these are used: the Norwegian, Newfoundland, Gulf Stream, Tropical Atlantic and Kuroshio EAZ. The greatest extent of each is 1,500 x 2,000 km. For several weeks each season data are collected along several profiles in these EAZ, during which large oceanographic ships make 25 to 30 cruises; airplanes and satellites are also used. Eight different agencies (principally the State Committee for Hydrometeorology and Environmental Control and the USSR Academy of Sciences) and ten institutes participate. The data are accumulated at the All-Union Hydrometeorological Information Scientific Research Institute-World Data Center at Obninsk, where preliminary reduction of the data is accomplished. The Main Geophysical Observatory in Leningrad analyzes the shipboard meteorological data. Two other regional centers, in Vladivostok and Odessa, collect and reduce the data for the Pacific and Atlantic Oceans, respectively. The material from all four centers goes to the WDC, and from there it goes to the interested parties on magnetic tape. The final goal is to produce a mathematical model of climatic variation. Presently all efforts are directed toward formulating a model of

interaction between the ocean and the atmosphere. This is the largest program in the USSR studying the interaction of the ocean and atmosphere. Figures 3.

USE OF SKAT-77 AEROGEOPHYSICAL STATION

[Article by V.N. Zakharov, B.A. Golovko and B.I. Gulyayev, "Dalgeologiya" Geological Production Association]

[Abstract] The SKAT-77 combined station, equipped with a spectrometer with 6 detection units, total NaI(Tl) crystal volume about 38 liters, has been in use for aerogeophysical surveying since 1982. Four additional detectors were installed to increase sensitivity. Experience in using this station in a gold-bearing area with gold-quartz ore near the surface has shown that ore zones are reliably detected by the SKAT-77 as low-contrast radiogeochemical anomalies. Work with the SKAT-77 in a tin-mining region near the Amur River has shown that the volume of information provided by the new device is much greater than with older devices, allowing quantitative estimates of ore content to be made in some areas. The availability of this new and more sensitive apparatus requires that corresponding adjustments be made in field survey techniques. Figures 2.

LITHOCHEMICAL EXPLORATION OF TITANIUM-ZIRCONIUM PLACERS

[Article by V.M. Vasilyev and L.N. Novozhenina, "Tsentrgeologiya" Geological Production Association]

[Abstract] The possibility of geochemcial exploration of placer deposits under platform conditions has not been previously studied. Studies of rare metal placer deposit flows have shown that exploration by this method can be quite effective for location of titanium-zirconium placers which extend to the surface. The work was performed in Belgorod Oblast on placers located by previous geological prospecting work. Samples of the silty-clayey or sandy fraction of alluvial deposits were taken from near the surface and subsequently screened for spectral analysis of the fraction smaller than 1 mm. One to three specimens per square kilometer were taken. Spectral analyses of

lithochemical specimens for titanium and zirconium were performed. The results
were plotted to yield graphs for determination of the location of potentially
productive placer deposits. Equations were derived for determination of the
true productivity of a diffusion flow, which was found to correlate with the
content of the elements and their satellites in the formations. Figures 3;
references: 5 Russian.

DEEP STRUCTURE OF SOUTHEASTERN CASPIAN DEPRESSION BASED ON REMOTE SURVEY
MATERIALS

[Article by L.F. Volchegurskiy, "Aerogeologiya" Production Association,
S.S. Maksimov, All-Union Scientific Research Institute of Oil and Gas, and
O.S. Obryadchikov, All-Union Scientific Research Geological Prospecting for
Petroleum Institute]

[Abstract] An analysis of the neotectonic plan for the Caspian depression was
based on careful interpretation of space photographs at scales of 1:1,000,000
to 1:250,000 and a study of the present-day relief. As a result, three large
neotectonic zones were defined and are briefly described. The landscape-
indication method of interpretation used reveals neotectonic elements and the
interrelationships among them. The present-day structures revealed are
related to depressions between domes or dome-to-trough transition zones. The
boundaries of neotectonic elements are related to regional and local specifics
of the subsalt complex structure. Combined analysis of results of interpreta-
tion and geological-geophysical studies allows more accurate determination of
the contour of subsalt upthrusts located by seismic prospecting. This allows
prediction of new objects for further geophysical studies in preparation for
deep drilling. Figures 1; references: 5 Russian.

DETECTION OF FORMATIONS OF REEF ORIGIN BY SEISMOSTRATIGRAPHIC RESEARCH

[Article by P.Z. Mamedov, Azerbaijan Institute of Petrochemistry]

[Abstract] Seismostratigraphic research was carried out to find and map reefs
in the region of upthrusts of the Apsheron and Andriyev Banks. This area is

the northeastern boundary of the shelf and the basin slope of the Mesozoic
paleocontinent. Seismic recordings made with relatively wide band (5-50 Hz)
filters and processed with preservation of true ratios of amplitudes yielded
information on changes in apparent reflection frequency and acoustic stiffness
in the cross section. A structural map illustrates the locations, dimensions
and shapes of predicted reefs. More detailed seismic prospecting is recommended
for these locaitons. Figures 3; references: 9 Russian.

LINEAMENT ZONES IN LAPTEV SEA

[Article by E.M. Golovachev and E.V. Shipilov, All-Union Scientific Research
Institute of Marine Geophysics; "Soyuzmorgeo" All-Union Marine Scientific-
Production Association]

[Abstract] There is great interest in determining the present-day structural
plan of the Laptev Sea area and its relationship to more ancient tectonic
elements in the region. A satisfactory solution can be obtained by analysis
of lineaments and their zones in the area. Optical processing of a bathymetric
map of the Laptev Sea was carried out using a standard optical apparatus based
on the concept of the relative unity of relief and geological structure.
Results of this analysis are briefly described. The singular and multistage
evolution and zonal migration of geodynamic systems has a mechanism basically
similar to the development of ancient platform cores by successive arc and
ring formation around them. Matter and energy transformations were found to
affect not only individual branches of the geodynamic systems along their
axes, but also neighboring, less consolidated space. The placement of folding
elements and outcroppings of intrusive rock around an arc was typical, with
portions evolving over significant periods of time and space, resulting in
the formation of echelons of blocks. The regularities of orientation of the
lineament zones confirm the correctness of the concept of a global network of
lineaments of ancient origin and migrational development of individual parts
of lineament zones. Figures 2; references: 8 Russian.

SYNOPTIC MOTIONS OF FINITE AMPLITUDE

[Article by G.G. Sutyrin, Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] Ageostrophic effects in the ocean are significant in intensive synoptic eddies such as in the Gulf Stream. Deviations in isopycnic surfaces within such eddies may be great. In balance models, inertial-gravity waves are filtered using both the solenoidal and the potential parts of the horizontal velocity, allowing them to be used to describe motions of finite amplitude. However, the number of variables in the problem is increased and the difficulty of solving the balance system of equations is increased. This article suggests a new filtration method allowing the problem to be reduced to calculation of the evolution of absolute vorticity and total pressure, the sum of the static and dynamic pressures, assuming satisfaction of the laws of conservation of Lagrangian and integral invariants. The method can easily be applied to a multilayer continuously stratified fluid. Figures 1; references 8: 4 Russian, 4 Western.

SOUND SCATTERING BY TEMPERATURE NONUNIFORMITIES IN OCEAN

[Article by V.P. Kuznetsov, Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] The problem of sound scattering in a randomly heterogeneous medium has been studied in various previous works, but with little resultant agreement. This article gives the derivation of equations describing this scattering assuming that fluctuations in compressibility, density and velocity are known. The scattering of the sound field in a heterogeneous medium is found to be determined primarily by monopolar sources of fluctuations in compressibility, dipolar sources of fluctuations in density and quadrupolar sources of fluctuations in the turbulent flow field. Equations for the effective differential scattering cross section of sound per unit volume of gas and liquid are derived. References 11: 9 Russian, 2 Western.

ROLE OF UNDERWATER THERMAL VENTS IN FORMATION OF GAS AND HYDROCHEMICAL
COMPOSITION OF SEA WATER ALONG KURIL ISLAND ARC

[Article by L.V. Chertkova and V.I. Guseva, Volcanology Institute, Far Eastern
Scientific Center, USSR Academy of Sciences, Petropavlorsk-Kamchatskiy]

[Abstract] In 1981-1984 during the 11th, 15th and 17th cruises of the
research vessel "Vulkanolog," the authors studied the influence of gases from
surface and underwater hydrotherms on the back side of the Kuril Island Arc
on the composition of the sea water. Waters of Kraternaya Bay, which is
connected to the Sea of Okhotsk by a narrow strait, were studied in detail.
It was found that underwater thermal sources create aureoles of anomalous
dissolved gas content in the sea. The search for underwater hydrotherms and
associated manifestations of hydrothermal-sedimentary metal sulfides can be
conducted by continuous gas-hydraulic surveying with subsequent interpretation
of anomalies found. Figures 3; references 5: 3 Russian, 2 Western.

BOUNDARY OF WEDDELL SEA WATERS IN EASTERN PART OF ATLANTIC SECTOR OF ANTARCTICA

[Article by P.P. Fedulov, Atlantic Scientific Research Institute of Fishing
Industry and Oceanography, Kaliningrad]

[Abstract] A hydrological survey carried out in June 1982 revealed the posi-
tion and some characteristics of the frontal zone separating the waters of
the Weddell Sea and waters of the Antarctic Circumpolar Current in a zone
between 18°W and 20°E. The front between the Antarctic Circumpolar Current
waters and Weddell Sea waters was discernible by large horizontal temperature
gradients, clearly evident in the 300-800 m layer where the gradient reached
0.2 degrees C/10 miles and the width of the frontal zone was 50-60 miles; the
front was relatively homogeneous in salinity in this depth interval. The
eastern boundary of Weddell Sea waters in the survey period was at about 20-
22°E. Hydrobiological studies, performed during the cruise, showed that the
Weddell Sea-Antarctic Circumpolar Current front is a natural boundary of
distribution of hydrobionts which may be good indicators of these bodies of
water. The clear-cut biological boundary between waters of the Weddell Sea
and those of the Antarctic Circumpolar Current indicates a rather high isola-
tion of communities populating them throughout the front. Figures 4; references
8: 2 Russian, 6 Western.

EVALUATION OF VALIDITY OF POTENTIAL VORTICITY EQUATION FOR DESCRIPTION OF SYNOPTIC PROCESSES USING POLYMODE DATA

[Article by V.V. Ivanov, Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] Assessment of discrepancies of the quasi-geostrophic potential vorticity equation using stream function fields obtained from POLYMODE current measurements shows that the discrepancy in the equation is largely due to data noise and truncation error. Figures 4; references 8: 7 Russian, 1 Western.

NEW DIAGRAMS OF INDIAN OCEAN WATERS SEASONAL CLIMATIC CIRCULATION

[Article by A.L. Brekhovskikh, Yu.L. Demin, I.G. Usychenko and A.D. Shcherbinin, Department of Computer Mathematics, USSR Academy of Sciences, Moscow, Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] Results of calculation of climatic currents in the Indian Ocean in summer and winter seasons, based on Sarkisyan's quasi-geostrophic model for density, wind and bottom relief fields (using 1° grid squares), are presented and discussed. The greatest large-scale seasonal variability of currents occurs in the northern section (north of 10°S) of the Indian Ocean. Reaction of the ocean to the shift of the monsoon wind does not extend below 250 m. Basic boundary currents in the 0-200 m layer remain stable throughout the year but current intensity changes significantly with the seasons. Land-locked circulation systems correlate closely with macroelements of bottom relief. The meridional component of the currents in the central part of the ocean increases appreciably with depth as a result of intensification of the topographic effect. Figures 3; references 11: 7 Russian, 4 Western.

DISTRIBUTION OF VERTICAL DENSITY AND TEMPERATURE GRADIENTS IN STABLY
STRATIFIED PYCNOCLINE LAYERS

[Article by I.D. Lozovatskiy and A.N. Porfiryeva, Oceanology Institute imeni
P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] An expression for the probability distribution function of
vertical temperature and pressure gradients in pycnocline stably stratified
layers is presented and discussed with comparison of model distribution and
experimental data. Variability of distribution parameters is associated with
hydrological processes at a synoptic scale. A dependence between the form of
distribution and the spectral structure of vertical thermohaline hetero-
geneities in the main pycnocline is established and discussed. Figures 4;
references 7: 4 Russian, 3 Western.

FINE THERMOHALINE STRUCTURE OF ANTARCTIC CIRCUMPOLAR CURRENT WATERS FOR
SECTION ALONG 25°E

[Article by S.S. Muravyev, Yu.V. Nozdrin and M.L. Pyzhevich, Oceanology Institute
imeni P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] Analysis of the fine structure of waters along 25°E, passing
through the Antarctic Circumpolar Current, in the layer 150 m to 700 m, was
presented and discussed. The fine structure was characterized as that with
heterogeneities with scales from 40 cm to 33 m. Subtropical, sub-Antarctic
and Antarctic water masses were defined and fine-structure variations of
temperature fields in each of these water structures were analyzed and dis-
persions of fine-structure variations of temperature and salinity fields were
evaluated. These indicators are independent of the type of water masses,
indicating a universal mechanism of generation of the fine structure. The
relationship of spectral densities of variations of temperature and salinity
fields decreases with an increase in wave numbers. Values of spectral density
of variations of the temperature field increase toward the southern part of
the section, as well as in regions of interaction of eddy formations and in
regions of interaction of differently directed flows of the Antarctic
Circumpolar Current. Figures 3; references 4: 2 Russian, 2 Western.

EFFECT OF VISCOSITY ON SMALL-SCALE MOTIONS IN STRATIFIED OCEAN

[Article by V.P. Maslov, Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] The effect of viscosity on the generation and persistence of internal waves and nonwave eddy modes during small-scale pulsed excitation in a density-stratified ocean are described and discussed. Long-lived forms of nonoscillating motions with a typical lifetime much greater than typical persistence of internal waves of the same spatial scales and orientation are examined in some detail. Amplitudes of arising internal waves and non-oscillating motions as a function of the nature of excitation were determined. A major feature of these motions is the distinct spatial orientation of the most long-lived motions, depending on geographic latitude. References 2: 1 Russian, 1 Western.

TURBULENCE GENERATION IN SHALLOW-WATER WAVES

[Article by S.Yu. Kuznetsov, Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] Conditions for generation and persistence of velocity fluctuations of movement of water particles under natural conditions in a shallow-water wave were studied in the Black Sea and Baltic Sea on sandy beaches with mean slope of the bottom on the order of 0.02. Velocity fluctuations were measured in nonbreaking waves in shallow water with depths of flow ranging from 1.5 m up to 2.4 m in wave periods from 3.8 s to 7 s. Laminar, pulsation and transitional flow regimes were detected. During transition from a laminar to a pulsation regime, fluctuations occur only under crests and troughs of waves. Wave flow asymmetry and its change with change of depth of flow have considerable effect on velocity fluctuations. The empirical criterion which adequately describes conditions of velocity fluctuations for the range of kinematic characteristics of wave flow studied is presented and discussed. Figures 3; references 10: 6 Russian, 4 Western.

LOW-FREQUENCY ACOUSTIC LATERAL WAVES IN OCEAN

[Article by O.A. Godin, Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] A study of acoustic lateral waves generated by a low-frequency concentrated sound source near the ocean bottom is described and discussed. Components undergoing one or two reflections from the solid rocky basement (subbottom) provide the basic impetus for lateral wave generation under the conditions existing in deep water. Integral representation of the sound field provided the main terms of asymptotic expansions of the field of lateral waves for large distances from the source. The effect of dissipation on the lateral wave field is described and discussed. Methods of determining some parameters of the sediment layer and the underlying bottom material on the basis of lateral wave characteristics, measured at one or two points, are described and discussed. Figures 1; references 7: 6 Russian, 1 Western.

ASSESSMENT OF RATE OF EQUATORIAL UPWELLING IN CENTRAL PACIFIC OCEAN

[Article by V.A. Bubnov, Atlantic Department, Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Kaliningrad]

[Abstract] Results of calculations of the rate of equatorial upwelling in the Central Pacific Ocean, based on observations of currents conducted in February-March 1980 during the 24th cruise of the scientific research ship "Dmitriy Mendeleyev," are presented and discussed. Calculations were carried out using a continuity equation on the basis of a "box" model for the area $1°30'N-1°30'S$, $163°15'W-167°W$. Vertical movement in the upper 300 m layer is directed upward with changes in rate within limits of $(1.0-8.0) \cdot 10^{-3}$ cm/s. Divergences of meridional currents play a large role in formation of features of vertical movement near the equator. Measurements continued for 28 days. Figures 3; references 4: 1 Russian, 3 Western.

EVAPORATION OF PETROLEUM HYDROCARBONS FROM OIL FILMS ON SMOOTH SEA SURFACE

[Article by A.V. Tkalin, Far Eastern Regional Scientific Research Institute of State Committee for Hydrometeorology, Vladivostok]

[Abstract] A method of calculating evaporation of petroleum hydrocarbons from films on a smooth sea surface is presented. Calculations were made on a YeS-1022 computer with the assumption that the thin petroleum film (no more than 1 mm thick) is homogeneous along the vertical and horizontal and is ideally mixed. Equations derived are suitable for practical use if some environmental parameters (temperature and windspeed) and film characteristics (thickness, area and fractional composition) are known. Calculations made it possible to isolate 8 hydrocarbon fractions. Figures 1; references 7: 1 Russian, 6 Western.

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GEOMORPHOLOGY OF REYKJANES RIDGE RIFT ZONE AT 58°30' NORTH

[Article by M.V. Rudenko, Atlantic Department, Oceanology Institute imeni P.P. Shirshov, USSR Academy of Sciences, Kaliningrad]

[Abstract] A study of the tectonic structure, magnetism, hydrothermal activity and biology of the Reykjanes Ridge rift zone, carried out on the 4th cruise of the scientific research ship "Akademik Mstislav Keldysh," July-October 1982, is discussed. Diagrams based on material obtained from the manned submersible "Pisces," showing the scheme of geomorphological studies, profiles of the rift zone relief, a bathymetric chart of the area and a geomorphological map of the area, are shown and discussed. The data obtained indicate that the rift zone and especially the rift valley have an oblique spreading type of structure. Figures 4; references 11: 6 Russian, 5 Western.

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SOME FEATURES OF FREQUENCY CHARACTERISTICS OF SEISMIC WAVES REFLECTED FROM
SEDIMENTARY LAYER CONTAINING FERROMANGANESE NODULES

[Article by V.N. Moskalenko and G.A. Semenov, Oceanology Institute imeni
P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] A study of spectra of reflected waves from the sedimentary layer
in a section of the Northeastern Basin of the Pacific Ocean, carried out during
the 28th cruise of the scientific research ship "Dmitriy Mendeleyev" in order
to explain the correlation between ferromanganese nodule production and
physical properties of the upper layer of sedimentation, is described and dis-
cussed. Many spectral parameters, calculated for the upper part of the
sedimentary layer, do not indicate changes in iron-manganese deposits pro-
ductivity. Spectra of the signal reflected from the sedimentary layer have
2 distinct peaks. The 2d peak of the spectrum is expanded up to 62 Hz from
sections of high productivity while it begins at 70-72 Hz from sections with
low productivity. In regions with high nodule productivity, the amplitude and
frequency of the 2d peak of the spectrum increases noticeably.

SESTON BIOMASS NEAR SEAMOUNTS IN WESTERN PART OF INDIAN OCEAN

[Article by Yu.A. Rudyakov and A.G. Timonin, Oceanology Institute imeni
P.P. Shirshov, USSR Academy of Sciences, Moscow]

[Abstract] Study of the seston biomass in the area of 3 seamounts in the
western Indian Ocean, carried out during the 36th cruise of the scientific
research ship "Akademik Kurchatov," did not confirm the assumption of a great
abundance of plankton in areas of individual seamounts but showed signs of
reduction in seston density in such areas, at least at a depth of more than
100 m. The average seston density by volume in the 0-100 m layer for the
areas studied is nearly 60 $mg \cdot m^{-3}$, which confirms existing ideas about the
abundance of plankton in this part of the Indian Ocean. Plankton density in
the equator seamount area is greater by a factor of 1.5 in the 400-600 m layer
than that in the 200-400 m layer. Figures 4; references 14: 12 Russian,
2 Western.

STUDY OF PELAGIC ZONE ECOSYSTEMS OF PACIFIC OCEAN SUB-ANTARCTIC WATERS

[Article by M.Ye. Vinogradov and M.V. Flint]

[Abstract] Research performed during the 34th cruise of the scientific
research ship "Dmitriy Mendeleyev" (16 December 1984-15 April 1985) included
study of hydrophysical characteristics, especially the thermohaline structure
and its variability in waters of different genesis and in contact zones
between them, study of the hydrochemical structure of the waters and its
relationship to hydrophysical and biological fields, study of biophysical
parameters of ecosystems and study of biological communities of the pelagic
zone of the central and western parts of the sub-Antarctic zone of the
Pacific. Results of the studies are discussed briefly. The research provided
a rather complete experimental assessment of phytoplankton and bacterio-
plankton production for these regions and an assessment of various ecological
and trophic groups of mesoplankton and macroplankton. Three latitudinal
zones with high biomass of mesoplankton suitable for plankton-feeding fish
were discovered during the voyage. Changes of structure of communities exist-
ing in various zones of the survey are described. Hydrophysical survey data
were used to construct a 3-dimensional circulation model of the region which
may be used to explain the high productivity of the region. Figures 1.

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SOME RESULTS OF STUDIES OF VERTICAL TURBULENT STRUCTURE AND PARTICLE-SIZE
DISTRIBUTION OF PARTICLES IN TURBIDITY CURRENT

[Article by Yu.C. Pyrkin, S.V. Galkin, A.A. Zelenov and M.A. Silayev, Moscow
State University]

[Abstract] Studies were performed in Nurek Reservoir, a 70 km long, up to
5 km wide and 20-25 m deep at the axis, with bottom slope 10^{-3}-10^{-2}. The
turbidity current propagates along the bottom of the reservoir, carrying a
large mass of solids dispersed in particles of up to 70 μm diameter, moving
at a mean speed of 60 cm/s. Analysis of particle-size distribution by depth
revealed considerable nonuniformity. The distribution of concentrations of
suspended solids in the stream of particles and turbulent parameters of the
flow were found to be correlated. Studies of turbulent energy transformation
made using a laboratory model allowed a deeper investigation of the phenomena.
Since the hydrodynamic parameters of the smallest and largest particles differ

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significantly, the distribution of their particle sizes reflects the turbulent structure of the current over a broad range of frequencies. This allows prediction of the turbulent structure of a current directly from the particle-size distribution and vice versa. Figures 4; references: 5 Russian.

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REACTION OF NEUSTON TO CHANGES IN SURFACE WATER LAYER TEMPERATURE

[Article by B.G. Aleksandrov, Yu.P. Zaytsev and G.N. Panin, Odessa Division, Institute of Biology of the Southern Seas, Ukrainian Academy of Sciences; Water Problems Institute, USSR Academy of Sciences]

[Abstract] A study was made of the migration of neuston in response to changes in surface-layer water temperature as the water interacts with the atmosphere and is exposed to sunlight. Studies were performed on Balanus improvisus Darwin. Samples were collected from the surface layer and at depths up to 3 m each 3 hours in Odessa Bay in April, June, August and October. The temperature factor was taken into account by determining the difference between water and air temperatures. It was found that the surface layer has, in addition to its special lighting conditions, an abundance of dissolved and suspended organic matter and a significant temperature gradient. Regression analysis revealed a reliable negative correlation between concentration of nauplii in the neuston and surface layer temperature. The daily course of surface-layer temperature was proven to influence the neuston, explaining specifics of its migrational behavior. Figures 3; references 29: 18 Russian, 11 Western.

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PECULIARITIES OF PRESENT-DAY STRUCTURE OF SOUTHERN ANTILLES REGION (SOUTH ATLANTIC)

[Article by A.G. Ryabukhin, Moscow State University]

[Abstract] The Southern Antilles region is the least investigated link in the Pacific folded belt, its study having been inhibited by extremely severe

climatic conditions and distance. This article discusses recent studies in the area, outlining its evolution. Many of the key elements of the palin-spastic reconstruction of Gondwanaland in the Mesozoic and Cenozoic depend on interpretation of the structure and history of development of the region. The analysis of the contemporary structure of the region indicates the mosaic nature of the structure, containing blocks of various ages with various types of crustal structure. One peculiarity of the Southern Antilles region is the relative youth of the structures which torm it. Formation of the region resulted from processes of destruction of the continental crust related to the splitting apart of South America and Antarctica 29 million years ago. Figures 1; references 21: 8 Russian, 13 Western.

6508/13046
CSO: 1865/28

BOTTOM RELIEF IN NEIGHBORHOOD OF SOUTHEASTERN PART OF FRACTURE

[Article by Yu.D. Yevsyukov and V.N. Moskalenko, Southern Branch, Oceanology Institute, USSR Academy of Sciences, Gelendzhik]

[Abstract] Detailed geophysical studies of the Emperor fracture were made for the first time on the 23d cruise of the research vessel "Dmitriy Mendeleyev." On the 29th cruise, the studies were continued in a section measuring 50 x 85 nautical miles. The data were processed, giving bathymetric charts reflecting the complex structure of the fracture. This article describes the data obtained, and presents graphs of the transverse profiles and a map illustrating the areas where the profiles were run. The new data indicate that the sector of the fracture studied includes ridges with heights of over 1,100 m, slopes of as much as 35-40°. The available bathymetric charts indicate that the maximum depth observed (7,987 m) may be the deepest in the entire fracture. Figures 2; references 6: 5 Russian, 1 Western.

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STRATIGRAPHIC ASPECT OF PALEOMAGNETIC STUDIES OF BOTTOM SEDIMENTS IN SEAS
AND OCEANS

[Article by A.N. Tretyak, L.I. Vigilyanskaya and V.P. Dudkin, Geophysics
Institute, Ukrainian Academy of Sciences, Kiev]

[Abstract] The purpose of this work was to demonstrate the possibility of
applying the paleomagnetic method to the stratigraphy of bottom sediments in
the ocean. Paleomagnetic methods can be quite useful in the stratigraphy of
sediments of the Pliocene-Pleistocene ocean bottom. The unreliability of
time correlations of geomagnetic events and episodes has resulted in the
development of two alternative concepts of the structure of very recent geo-
magnetic time. The characteristics of spatial changes of the geomagnetic
field are also poorly known. A number of results published in the literature
indicate the very complex nature of changes in the geomagnetic field over the
past million years. Some results obtained by the authors in paleomagnetic-
stratigraphic studies in the Indian and Atlantic Oceans are briefly discussed.
Detailed study of the magnetization of these bottom sediments reveals a series
of brief reversals of geomagnetic field polarity, strictly correlated in time.
These events in the magnetic history of the earth can serve as reference levels
to be used in stratigraphic correlation of other materials from other areas.
Deep marine deposits can yield good information for the development of paleo-
magnetic stratigraphy. Some deep-water sediments contain a complete or nearly
complete record of the development of the terrestrial magnetic field over the
past 3.5 million years. Figures 5; references 34: 23 Russian, 11 Western.

TEN CRUISES OF 'VITYAZ' SCIENTIFIC RESEARCH SHIP

[Article by V.I. Voytov, doctor of geographical sciences]

[Abstract] Scientific research carried out by ships named "Vityaz" is dis-
cussed. Work performed by the first three ships, operating during the period
from 1970-1979, including oceanographic study and related research in the New
Guinea area, the Mariana deep, the Indian Ocean, Mediterranean Sea, South
Atlantic, Gibraltar and adjacent areas, is mentioned briefly while research
performed on 10 cruises of the "Vityaz," commissioned in December 1981, is
discussed in somewhat greater detail. The work described included research in
marine geology, hydrophysical studies, biological studies and physics. Some
of the new and specialized "Vityaz" scientific equipment is discussed briefly.

MEMBERS OF USA-USSR SEISMOLOGY GROUP AT SEMIPALATINSK

Moscow KOMMUNIST in Russian 22 Aug 86 p 3

[Text] Kazakh SSR -- A Soviet-American experiment for verifying that nuclear tests are not being conducted has been carried out near the Soviet nuclear test site in the vicinity of Semipalatinsk. Scientists of the USSR Academy of Sciences and of the U.S. Committee for Protection of Natural Resources took part in this experiment. The researchers were brought here not only by their scientific interests but also by their public and civic concerns. All are active advocates of a ban on nuclear tests.

(The photograph shows Yevgeniy Sutulov, a Soviet engineer, and two Americans, engineer Paul Bodine and instrument technical David Carrel, preparing seismic recording apparatus in a field.).

FTD/SNAP
/13046
CSO: 1865/2

AVIATION INSTITUTE DEVELOPS RADAR FOR GEOLOGICAL SURVEYING

[Article by V. Proskura, correspondent (TG) (Riga)]

[Text] A new and original device -- a radar for probing beneath the surface of the earth -- has earned high praise from specialists. Information about various underground structures is obtained with it.

The device, which was developed at the Riga Institute of Civil Aviation Engineers, makes it possible to dispense with costly borehole surveying. It is installed on an ordinary motor vehicle. The radar also can be used to estimate reserves of ground water.

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EQUIPMENT FOR SEISMIC PROSPECTING FROM HELICOPTERS

Moscow SOVETSKAYA ROSSIYA in Russian 12 Oct 86 p 6

[Article by N. Dombkovskiy (Krasnodar)]

[Excerpt] The first tests of equipment for aerial seismic geological prospecting began yesterday in Krasnodar.

An MI-8 helicopter hovered over a shallow body of water. Fastened to an outside sling on this helicopter was a special device -- a long tape with electronic sensors. A jagged line of pulses with different heights appeared on the screen of an oscilloscope in seconds.

"What you see here is a prototype of apparatus with which many helicopters will soon be equipped," related A. Savchenko, head of the Krasnodar affiliate of the State Scientific Research Institute of Civil Aviation. "It is the latest in seismic geological prospecting. There are a considerable number of places on our country's territory, such as the coastal shelf, beds of lakes, and estuaries, where sizable mineral resources are hidden beneath a thin layer of water. Discovering them by conventional methods is not so easy: geological vessels cannot get into shallow bodies of water, and prospecting of suitable quality cannot be done from the shore. This is why an instrument-complex for aerial seismic prospecting is being developed at our institute."

The day before, a helicopter had delivered a so-called compressed-air gun to the area of shallow water. Compressed air stored in a tank under high pressure bursts from the tank and strikes a metal plate with tremendous force. A seismic wave goes deep into the earth and is reflected by discontinuities. The signals from the earth's interior are received by seismic sensors fastened to a tape 2 kilometers long. Our MI-8 had just reeled out such a tape along the bottom of the body of water.

Information obtained from this original seismic detector is of tremendous value to scientists. By repeatedly moving the seismic strip, as the tape with the sensors is called, helicopter pilots are helping geologists obtain a three-dimensional picture of discontinuities at deep levels of the earth.

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ARCTIC ICE MAPPING WITH SATELLITE DATA AT SP-28 STATION

[Article by A. Ryabushev, member of the SP-28 drifting station in the Arctic Ocean (by radio)]

[Excerpt] The ice floe of the SP-28 drifting station has drifted a distance of nearly 570 kilometers since our group of young Leningrad scientists began operating the station 4 months ago.

In a small building with an antenna aimed skyward, radio engineer Viktor Karasev receives information from an artificial earth satellite. "Television cameras are installed on the satellite," Viktor explained. "The satellite passes over the Arctic Ocean several times a day. It photographs the ocean's surface, and when it enters into the zone of radio contact with SP-28, it sends us a signal. From it we obtain photo negatives of the ice situation on a special film."

Karasev is helped in getting the information from space by Konstantin Yagudin and Gennadiy Ushman, programmers of SP-28's computer center. For the first time at a drifting station, a computer is being used to calculate the times of entry of satellites into the zone of radio contact and to track them. Engineers Andrey Pavlov and Oleg Folomeyev analyze the information and compile maps of the ice situation over the whole Arctic. Radio operators Peter Polyanskiy and Boris Dobromil are working to get a facsimile transmitter operating. This will make it possible to transmit data to Leningrad, to the scientific center of ice information, more quickly than has been done in the past.

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LITHOSPHERIC STRUCTURE AND DEEP STRUCTURES OF GREATER AND LESSER KURILS

[Article by T.K. Zlobin, Sakhalin Complex Scientific Research Institute, Far Eastern Scientific Center, USSR Academy of Sciences, Novoaleksandrovsk, Sakhalin Oblast]

[Abstract] The outer and inner zones of the Kuril arc differ with respect to age and the composition of the rocks, magmatism and volcanism, geodynamic regime and other characteristics. These differences can be understood only through a knowledge of the deep structure of the arc and therefore a crustal model was formulated on the basis of deep seismic sounding work carried out during the period 1957-1959. Since such work was done only in the Okhotsk Sea and in the Pacific Ocean, the structure mapped directly beneath the two arc zones was based on interpolation. Deep seismic research (by the deep seismic sounding and earthquake exchange waves methods) was carried out directly on the Kuril Islands for the first time in 1977-1982. Observations by the exchange waves method were made at 66 points on Kunashir, Iturup, Shikotan and other islands and deep seismic sounding was carried out on Kunashir and Iturup. Data on depths of seismic discontinuities were obtained at considerable distances from the observation points. Seismic sections were constructed both along and across the strike of the island arc. This made it possible to ascertain differences between the internal deep structure of the arc and the model constructed earlier. Five-six seismic discontinuities were detected at depths to 30 km, associated with the crust, whereas the others were situated in the upper mantle. The lithospheric section across the strike of the arc revealed that the thickness of the Cenozoic-Upper Cretaceous formations increases to 12 km under Kunashir and decreases to 5 km under Shikotan. The top of the Mesozoic-Paleozoic formations rises under the Lesser Kurils. The thickness of the "basalt" layer is 9-12 km in the outer zone and increases to 22 km at the southern end of the inner zone. Along the considered profile the crust has a maximum thickness up to 33 km under Kunashir Island, evidently attributable to an augmentation of the crust both upward and downward as a result of increase in the thickness of the "basalt" layer. Figures 2; references: 15 Russian.

STATISTICAL PROPERTIES OF GEOTHERMAL FIELD

[Article by S.S. Sardarov (Jr.) and K.S. Kaziyev, Geothermal Problems Institute, Dagestan Affiliate, USSR Academy of Sciences, Makhachkala]

[Abstract] Since the earth's crust is broken by a network of disjunctive dislocations of difference scales, from fractures to lineaments, Academician M.A. Sadovskiy, in a series of studies, postulated that there are predominant dimensions of the blocks forming due to such dissection and marshalled facts confirming his hypothesis. Sadovskiy visualized a geophysical medium constituting a hierarchically organized system of blocks fitted one into another. Most of the examples he advanced related to geochemistry and seismology and it remained unclear whether natural geophysical fields manifest similar properties and how they are related to the tectonic block structure. The hierarchical organization of the medium also was not fully demonstrated because the existence of a hierarchy reflects not only the presence of a discrete set of description levels, but also the possibility of discriminating a set of subsystems from the system which would be convergent with respect to some criterion. These and other matters can be clarified by a study of geothermal fields made with allowance for the specifics of interaction between the thermal field and the block structure of the medium. The statistical characteristics of the geothermal field were investigated for a series of regions (earth's crust as a whole, North American Platform, Southern Dagestan, Australian Platform, and others) in order to ascertain whether the geothermal field conforms to such a hierarchical structure. The analysis shows that the geothermal field can form a hierarchical discrete series of relatively homogeneous zones separated by regions of geothermal inhomogeneity with conservation of statistical similarity, manifested in a constancy of the relative scatter of geothermal field parameters at different hierarchical levels. This property is closely related to the existence of active (disjunctive dislocations) and passive (blocks) elements in the earth's crust. Figures 3; references: 10 Russian.

EARTHQUAKE MIGRATION AND CHAIN REACTION IN APPEARANCE OF FOCI

[Article by I.Ye. Gubin, corresponding member, USSR Academy of Sciences, Earth Physics Institute, USSR Academy of Sciences, Moscow]

[Abstract] Earthquakes migrate individually or in groups, depending on the geological structure in a zone. The next events occur primarily in those places where they have not occurred in a long time, especially between the foci of preceding events in "seismic windows," places where tectonic stresses have accumulated for a relatively long time along faults. A linear-intermittent migration occurs only in zones of marginal seismogenic dislocations as a result of some movement of a major tectonic complex. This process is complicated by the interaction of individual structures, which occurs in a chain mechanism. The displacement of one structure causes the redistribution of stresses in the zone and in some cases results in the movement of adjacent structures, but in other cases, movement of distant structures, especially in places where tectonic stresses along faults have approached the release stage. Successive movements of adjacent structures result in formation of a tight group of foci in a relatively short time. The structures most ready for displacement are entrained in the chain mechanism in extensive uniform zonal sectors extending for hundreds of kilometers. Series of earthquake foci are formed in the process which are separated by "seismic windows." Within the seismogenic zones there are periods of relative seismic quiet and earthquake generation, different in different zones and dependent on the rate of movement of geological structures and a corresponding accumulation of tectonic stresses along faults necessary for the next seismogenic displacements. In the case of a high rate of tectonic movements the rate of earthquake recurrence is high and the periods of seismic quiet are short or absent. The reverse is true if there is a slow rate of movement. This chain reaction phenomenon is illustrated in a series of examples. Therefore, there is far less uncertainty now concerning the sequence of occurrence of earthquakes in seismogenic zones. The most dangerous places for earthquakes are not those where destructive earthquakes have occurred recently, but sectors along which stresses have long been building up. Figures 2; references 13: 12 Russian, 1 Western.

STUDY OF HEAT CONDUCTIVITY OF ROCKS IN UPPER HORIZONS OF PECHENGA STRUCTURE

[Article by Yu.A. Popov, V.Ye. Boytsov, V.V. Berezin, V.S. Lanev, V.G. Semenov and V.S. Konyrev, Moscow Geological Prospecting Institute imeni S. Ordzhonikidze]

[Abstract] A detailed study of the properties of rocks in the core of the Kola superdeep hole became possible by use of a new contactless scanning method described by Yu.A. Popov, et al., in IZV. AN SSSR: FIZIKA ZEMLI, No 1, pp 88-96, 1985. The method makes possible a quantitative description of microinhomogeneities of samples using the thermal diffusivity coefficient β, which together with the heat conductivity value λ, averaged for a sample, allows study of the influence exerted on heat conductivity by both mineral composition and by the structural-textural properties of rocks. This article gives the first results of such detailed investigations of rock thermal properties in the depth range 0-3,000 m. Studies were made of core samples in an air-dry state with a depth interval of sampling of 1 m. The smallness of this interval was dictated by the great variability of thermal properties of rocks in the upper part of the borehole section (Lower Proterozoic sedimentary-volcanic complex). Using statistical criteria, employing the totality of the results of β and λ determinations in core samples (as well as their geological characteristics), it was possible to discriminate the principal mineral-thermophysical rock groups. The mean values and sample standard deviations of the λ and β parameters ($\overline{\lambda}$, σ_λ, $\overline{\beta}$, σ_β) were calculated and are given in Table 1 (16 rock groups are listed). These results clearly demonstrate that heat conductivity can be used as a geophysical parameter in borehole research. Figures 2; references: 3 Russian.

LONG-PERIOD SEISMOMETER WITH FEEDBACK FOR FIELD SEISMIC STATIONS

[Article by Yu.V. Shevchenko, Yu.A. Lyannik, B.I. Sennikov and Ye.S. Fedorov, Volcanology Institute, Far Eastern Scientific Center, USSR Academy of Sciences]

[Abstract] The article describes the development of a channel with a feedback which is convenient in practical use and reliable in operation under field conditions. The theory and design of the system and the characteristics of the channel are presented. The main source of noise was ascertained and ways

to enhance channel response were explored. The research results were tested
using mathematical and real models. The proposed design for a seismometric
channel with an active feedback makes it possible to use wide-band channels
for the registry of displacement, velocity or acceleration of the ground when
using short-period seismometers. The seismometer frequency f_s is related to
the lower f_L and upper f_H limits of the channel passband by the expression
$f_s = \sqrt{f_L/f_H}$. The maximum magnification which can be obtained using this
seismometer and amplifier is reduced with a broadening of the passband. If
magnification is inadequate, a seismometer with high response of the working
coil or an amplifier with a lesser noise level must be used. An expression
was derived for computing the dynamic range of the registered signals. The
range of the registered displacements is greater at a channel output whose
voltage is proportional to acceleration, and less for an output with a voltage
proportional to the displacement in the passband. The described seismometer
with an active feedback is characterized by considerable nonlinearity
associated with null-point drift usually characteristic for seismometers with
a large physical period. The methods for channel calibration are discussed
in detail. Figures 6; references: 7 Russian.

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KOLA SUPERDEEP BOREHOLE AND SOME ASPECTS OF INTERPRETATION OF DEEP
GEOPHYSICAL RESEARCH DATA

[Article by F.S. Moiseyenko]

[Abstract] A considerable volume of published material on the Kola superdeep
borehole has made possible an objective evaluation of the difference between
the anticipated and actual results, a determination of the role and relia-
bility of geophysical data in deep geological research, detection of possible
errors and blunders in the geological interpretation of geophysical data in
the planning of drilling work and a critical assessment of proposed variants
for the interpretation of these results. The results of drilling of this
deep hole revealed the untenability of the interpretation of seismic data
made earlier and this has resulted in the discarding of the layered-block
model of the earth's crust in its earlier form. Although a single superdeep
hole cannot cast light on all fundamental aspects of deep geology, it has
exerted a substantial influence on the development of deep geological research.
In particular, it has demonstrated the objectivity and reliability of seismic
data, the great importance of laboratory petrophysical measurements and the
need for a comprehensive approach in the interpretation of geophysical data.
On the other hand, the results have irrefutably shown the unacceptability of
interpretation of seismic data by use of a single method, heedlessly ignoring

results obtained by other methods. The drilling data clarified the realistic possibilities of deep seismic sounding and have led to a rethinking of the principles of interpretation of seismic data obtained by deep seismic sounding. It was found that the use of the reflected waves method has been excessive, with the refracted waves method having fallen into virtual disuse. Considering the important role of elastic anisotropy of rocks, the refracted waves method is effective in preventing blunders in the interpretation of data obtained by the reflected waves method. The reality and nature of zones of reduced velocities in the upper part of the crust have been confirmed. Equally important, it has been clearly shown that at great depths there are dislocations in the form of zones of rock fragmentation, an increase in their porosity and water saturation. An increase in the homogeneity of rock layers with depth has been refuted and on the contrary, at least to a depth of 12 km the internal structure of the metamorphic strata persists. New initial data have been obtained for constructing a revised model of the earth's crust. Figures 1; references 32: 30 Russian, 2 Western.

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DYNAMIC FACIES OF GOLD-BEARING FORMATIONS

[Article by M.M. Konstantinov, Central Scientific Research Geological Prospecting Institute for Nonferrous and Noble Metals, Moscow]

[Abstract] The application of the formation approach for studying formations containing gold ores is becoming increasingly common. A comparison of sedimentary, volcanic and plutonic formations containing gold deposits revealed a common characteristic of the facial groups of rocks associated with gold mineralization. This made it possible to clarify the dynamics of the tectonic regime characteristic for the formation of gold ore deposits. The time relationships of gold mineralization are quite diverse, as are the pertinent facies described in the article. In some cases ore deposition and rock formation were synchronous, as indicated by the participation of both in cosedimentation folding and the presence of ore fragments in the covering deposits. In other cases the early mineralization stages were synchronous with rock formation, whereas the late stages appear superposed, attributable to both hydrothermal and metamorphogenetic processes. In still other cases mineralization is observed in the age "fork" represented by different phases of dike formation or the mineralization is associated with fissure systems which were rejuvenated or superposed on preceding formations and regarded as detached from ore-bearing strata over an indefinite time interval. The time position of mineralization is difficult to ascertain and is therefore difficult to use in predictions. On the other hand, the specific characteristics of facies spatially matched with mineralization can be detected in a

geological survey and used in discriminating promising areas. The association
of mineralization with dynamic facies is not random because it either directly
reflects ore formation conditions or reveals the position of local proto-
structures. Figures 1; references: 3 Russian.

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CSO: 1865/34

NEW DATA ON PALEOZOIC-MESOZOIC VOLCANISM ON SOUTHERN SAKHALIN

[Article by V.M. Grannik, Marine Geology and Geophysics Institute, Far Eastern
Scientific Center, USSR Academy of Sciences, Yuzhno-Sakhalinsk]

[Abstract] The earliest volcanism on southern Sakhalin was associated with
formations of the Susunay metamorphic complex, for the most part represented
by sedimentary sandy-clayey, siliceous and calcareous rocks and quite wide-
spread products of basaltic volcanism. Study of the composition, structural-
textural characteristics of the Susunay rock complex, facies makeup and other
criteria made possible determination of the position and type of volcanic
centers. There were centers of brief volcanic activity of the fissure type
and centers of prolonged activity with fissure outpourings of lavas forming
underwater volcanic mountains, volcanic islands or abyssal plateaus. In the
early stages volcanism was discontinuous in general, but locally continuous.
During periods of relative rest there was an accumulation of sedimentary
formations. In the final stages continuous volcanic eruptions occurred
simultaneously over a quite extensive territory. In the investigated region
there was a distinct composition of volcanic products in time and a zonal
character of their areal distribution. Volcanic activity began with out-
pourings of exclusively tholeiitic lavas which with time were replaced by
alternating flows of tholeiitic, subalkaline and alkaline lavas. Three
distinct zones of development of associations of volcanites can be discrimi-
nated in a lateral direction from north to south. The morphology and extent
of the reconstructed volcanic structures and the zonality in distribution of
associations of basaltic rocks indicate that the volcanism manifested in this
region was similar to rift zone volcanism. Figures 2; references: 6 Russian.

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NATURE OF SLOPE OF BENIOFF SEISMOFOCAL ZONES AND PROBABLE MECHANISM OF THEIR FORMATION

[Article by T.K. Zlobin, Marine Geology and Geophysics Institute, Far Eastern Scientific Center, USSR Academy of Sciences, Yuzhno-Sakhalinsk]

[Abstract] A hypothesis of formation of seismofocal zones is proposed which explains their slope from a new point of view, an alternative to the subduction mechanism. It is based on a joint examination of data on the structure of different seismofocal zones, structure and dynamics of the earth's crust and upper mantle. It is postulated that in the process of the earth's evolution there were horizontal movements of the layers and vertical movements of blocks in its upper horizons; the crust and upper mantle were dissected both into blocks and subhorizontally bedded layers and in seismofocal zones contain asthenospheric layers of increased plasticity; a superdeep near-vertical fault was present at the boundary between the Asiatic continent and the Pacific Ocean from ancient times in the earth's history. The slant distribution of earthquake foci observed in this region is a result of the evolution of this structure and a subsequent change in its slope. The proposed mechanism is consistent with data on foci of earthquakes in the Pacific Ocean seismic zone. There, in the upper part of the focal zone (to depths of 100 km) compressional stresses are oriented primarily at small angles to the horizon and across the strike of the main tectonic structures. There is a distinct predominance of steep and subvertical faults to the entire depth of the focal zone with the movement of matter primarily upward-downward and to a lesser degree, horizontally. It seems evident that the slope of seismofocal zones, especially those with a steep dip, is more simply and naturally explained by the proposed hypothesis of a steplike subhorizontal displacement of layers and the vertical movement of blocks than by the subduction hypothesis. Figures 3; references 15: 11 Russian, 4 Western.

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CSO: 1865/388

SOIL-GAS AND THERMOMETRIC SURVEYS IN STUDY OF DEPOSITS OF HIGH-TEMPERATURE HYDROTHERMS ON KAMCHATKA

[Article by Ye.A. Vakin, G.N. Lyalin and A.L. Samoylenko, Volcanology Institute, Far Eastern Scientific Center, USSR Academy of Sciences]

[Abstract] The Severo-Mutnovskoye geothermal deposit is located to the south of Petropavlovsk-Kamchatskiy in the Eastern Volcanic Zone. This is the largest

of the subterranean heat sources among those explored on Kamchatka. The deposit extends for 10 km to the north of Mutnovskiy Volcano (Fig. 1 is a full-page schematic geological map of the deposit). Soil-gas, emanation and thermometric surveys were carried out in the deposit for clarification of the nature and spatial location of concentrations of superheated waters and steam high-temperature rocks, heat-releasing fault zones and for facilitating more efficient siting of boreholes. The geological section of the region consists of volcanic-sedimentary and volcanic rocks of Oligocene to recent age. A very comprehensive and sophisticated survey was made in the most promising areas of the deposit. Measurements were made at more than 1,400 points in an area of 13 km^2. The survey was made in a grid measuring 100 x 100 m and along profiles with a distance between observation points of 100 m. Measurement procedures and criteria used are fully described. It was found that the part of the Severo-Mutnovskaya volcanotectonic zone most favorable for the pene-tration of hydrotherms is in the sector of its intersection with a system of faults of northeasterly strike. In the neighborhood of the Dachnyye springs in an area of about 2 km^2 there is a steam-condensate zone with a depth of the heat carrier less than 600 m. This work demonstrates that a combined soil-gas and thermometric survey can be effective in detecting concealed steam hydro-therms in the reconnaissance and exploration of geothermal deposits.
Figures 5; references 10: 9 Russian, 1 Western.

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CSO: 1865/368

SOLUTION OF DIRECT GRAVIMETRIC AND MAGNETOMETRIC PROBLEMS ON BASIS OF NEW ANALYTICAL REPRESENTATIONS FOR ELEMENTS OF FIELDS FROM STANDARD APPROXIMATING BODIES. II

[Article by V.N. Strakhov, M.I. Lapina and A.B. Yefimov, Earth Physics Institute imeni O.Yu. Shmidt, USSR Academy of Sciences]

[Abstract] The first part of this research (V.I. Strakhov, et al., IZV. AN SSSR: FIZIKA ZEMLI, No 6, pp 55-69, 1986) presented efficient algorithms for the solution of direct gravimetric and magnetometric problems and explained the importance of such work. New analytical expressions were derived for the elements of outer and inner gravity and magnetic fields from standard approxi-mating homogeneous bodies: polygons for the two-dimensional problem, and polygonal plates and plyhedrons for the three-dimensional problem. The second part of the research describes the programs worked out for implement-ing the proposed approach. A number of special procedures were applied for increasing the accuracy and speed of the programs. A description is given for the auxiliary algorithms used in the complex, the general characteristics of the latter are outlined and the results of testing of these programs are given for a large number of model examples. The two parts of the work are

not regarded as a finalization of research, but only as a contribution to solution of the problem. The research to be done in the future includes derivation of a large number of formulas for special, but geophysically important, homogeneous two- and three-dimensional bodies. New formulas must be derived for two- and three-dimensional bodies with polynomial (linear, quadratic) density and magnetization, work involving great analytical difficulties. Combined algorithms must be written in which computation of elements of fields from standard approximating homogeneous bodies in the near zone is accomplished using precise formulas and in the distant zones using approximate formulas. Figures 7; references: 3 Russian.

PROSPECTS FOR DEVELOPING GRAVITATIONAL GRADIOMETER FOR MOVING BASE

[Article by I.I. Kalinnikov, Earth Physics Institute, USSR Academy of Sciences]

[Abstract] At one time the gravitational gradiometer was the main instrument used in gravimetric reconnaissance work. However, it suffered from the following deficiencies: unwieldiness, long time required for measurements at stations, low resolution for many classes of objects, rigorous requirements on measurement conditions and need for rigorous allowance for relief in the near zone. It was therefore displaced by less informative but more highly productive gravimeters. Increasing demands on detail of surveys was satisfied by an increase in gravimeter accuracy and improvement in methods for analytical determination of the second and third derivatives. However, the time has come when the need for detail dictates efforts to make use of the advantages of gravitational gradiometers, provided that their deficiencies can be eliminated. They must be capable of operating on a moving base. The difficulties involved in attaining such an objective are extremely great and it seems that no progress along these lines has been made in the last 50 years. The article gives an analysis of the reasons for such seemingly insuperable difficulties. On the basis of this analysis the conclusion is drawn that no rigorous evaluations of the prospects for developing such a gravitational gradiometer can be made until after derivation of a "new Einstein formula" for Brownian motion in gravi-inertial instruments. Since the main source of noise in accelerometers, gravimeters and gradiometers is gravi-inertial disturbances, not thermal noise, the use of cryogenic methods for increasing response cannot provide any increase in the accuracy in measuring gradients. It is further concluded that if a gradiometer in a phase-frequency variant on a moving base cannot be developed, it cannot be created at all. Figures 2; references 15: 14 Russian, 1 Western.

MAPPING OF UPPER MANTLE OF ALPINE BELT OF EURASIA BASED ON ABSORPTION OF
SHORT-PERIOD TRANSVERSE WAVES

[Article by A.R. Arakelyan, Yu.F. Kopnichev and I.L. Nersesov, Armenian
Geology Administration; Earth Physics Institute imeni O.Yu. Shmidt, USSR
Academy of Sciences]

[Abstract] A description of the method and results of mapping of the Central
Eurasian Alpine Belt is presented based on absorption of short-period
irregular waves from earthquakes from the intermediate zone of epicentral
distances, 200-2,000 km. Recordings of earthquakes by temporary stations
located in the Ukraine, Urals and Caucasus were used in the study. A map of
the absorption field of the Central Alpine Belt is presented, indicating that
the western portion has elevated absorption, possibly due to the more recent
volcanism of this region. Large absorption field heterogeneities are
evident. Absorption field anisotropy characteristics were determined. The
relationship of strong earthquakes to areas of greater absorption contrast
is noted. The results show that further study in this area by this method
may be significant for seismic regionalization as well as geological and
tectonic studies. Figures 4; references 19: 15 Russian, 4 Western.

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DIVISION BOUNDARIES IN ARMENIAN CRUST BASED ON SEISMIC DATA

[Article by M.S. Badalyan, A.A. Kirakosyan and I.B. Osipova, Institute of
Geophysics and Engineering Seismology, Armenian Academy of Sciences;
Geological-Geophysical Expedition, Armenian Geology Administration]

[Abstract] An attempt is made to draw together all available seismometric
data and on this basis to compose a system of division boundaries in the
terrestrial crust for subsequent utilization in the construction of geo-
physical models. This article briefly describes the materials used, and
applies statistical analysis to estimate the accuracy of the method for
determining the depths of division boundaries in the crust. Maps illustrate
the surface of the Eopaleozoic basement, the Conrad and the Mohorovicic
surfaces and the thickness of the "granite" and "basalt" layers. Figures 6;
references: 14 Russian.

6508/13046
CSO: 1865/395

CHARACTERISTICS OF ANOMALIES IN VARIABLE MAGNETIC FIELD FROM REMOTE SOURCE
OVER CYLINDRICAL CONDUCTORS

[Article by E.S. Sedelnikov and Yu.S. Spasennykh, USSR Ministry of Geology,
Central Scientific Research and Geological Prospecting Institute]

[Abstract] The anomalies evoked by geological formations of differing
electrical conductivity in variable magnetic fields from distant sources such
as ionspheric currents, lighting discharges and very long wave radio stations
can be classified by analyzing the results of measurement of the amplitude
and phase of a variable magnetic field. Anomalous fields are analyzed in
this article for a circular cylinder in a homogenous space. The analysis
touches upon the results of the classical solution of the diffraction
problem. The results of measurement of a variable magnetic field can be used
to determine the electromagnetic parameters of an object and its depth of
occurrence. Anomalies can be classified, singling out those which are of
significance for the search for minerals. Figures 6; references 6:
5 Russian, 1 Western.

6508/13046
CSO: 1865/12

DISCOVERY OF NATURAL GOLD AND PLATINUM INTERMETALLIDE

[Article by V.L. Levin, P.Ye. Kotelnikov, Ye.A. Kurmanbayev, S.Sh. Madina
and B.M. Tasov, Geological Sciences Institute imeni K.I. Satpayev, Kazakh
Academy of Sciences, Alma-Alta]

[Abstract] Several grains of gold were found in a quartz sample. Some of
the gold grains were white in color. A study of these areas by x-ray spectral
microanalysis revealed that the white color was due to the presence of
platinum. Detailed studies revealed a previously unknown natural inter-
metallide of gold and platinum with Au:Pt ratio 1:1, which the authors have
called the K phase. The ore in which the platinum was found came from the
central portion of a large anticlinal structure oriented north to south.
The quartz vein, about 200 m in length and averaging about 1 m thick, had the
same strike as the surrounding carbonaceous-clayey, sericite, chlorite-
silicaceous and sericite-silicaceous shales, with infrequent aleurolites
and polymictic sandstones. A photograph of a grain of gold containing the new
phase is presented, plus a portion of the Au-Pt-Ag state diagram showing the

results of analyses of platinum-containing gold grains. Figures 3;
references 7: 5 Russian, 2 Western.

MECHANISM OF FORMATION OF EARTH'S CONTINENTAL CRUST

[Article by O.A. Bogatikov, doctor of geological and mineralogical sciences,
and A.A. Tsvetkov, doctor of geological and mineralogical sciences]

[Abstract] Augmentation of the continents occurs at the expense of the
transition zone from the ocean to the continent. Continental growth occurs
due to the successive adding-on of volcanic zones. Much research is being
done on formation of the continental crust as a result of magmatic activity
in transition zones from the ocean to the continent. It is now clear that
there is a definite relationship between continental growth and processes
transpiring in island arcs (Figure 1 is a map of the location of the most
important island arcs relative to the boundaries of lithospheric plates).
Present-day magma formation to a high degree is associated with these island
arcs. The genesis and evolution of island arcs is attributable to processes
transpiring in seismofocal zones. There is a continuity in island arc
evolution and it is possible to distinguish three types of present-day arcs:
young, well-developed and mature. The traces of ancient island arcs can be
detected within folded zones on the continents. The continental crust
therefore "matures" from the oceanic crust as a result of a long and complex
process of evolution of island arcs from young to mature (Figure 4 is a
detailed diagram of magmatic evolution of an island arc from the stage of
its appearance to attachment to the continent). It is stressed that the
duration of development of arcs may differ considerably, attributable to the
fact that in individual arcs the duration of periods of tholeiitic,
calcareous-alkaline and other rarer types of magmatism is considerably
different. The accretional development of a continent is illustrated in
Fig. 5 for the case of the northeastern part of Asia. Figures 5;
references: 2 Russian.

ISOTOPIC-GEOCHEMICAL CHARACTERISTICS OF DISSEMINATED GOLD-ORE MINERALIZATION
ZONES IN CARBONACEOUS ROCK

[Article by N.M. Zairi, A.P. Glukhov, I.I. Palkin and Ye.A. Zvyagina, Central
Scientific Research and Geological Prospecting Institute for Nonferrous and
Noble Metals, Moscow]

[Abstract] Studies were made to determine the isotopic and geochemical
characteristics of gold ores and to formulate typomorphic characteristics of
the locations of zones of dispersed mineralization. The isotopic composition
of the sulfur was determined by mass spectrometry in sulfides of all litho-
logic-facial varieties of rock in the area studied, a deposit in the Upper
Proterozoic. A correlation is found in the $\delta^{34}S$-C_{org}-Au series, indicating
primary elevated gold content in quartz-carbonaceous shale in comparison to
clayey varieties. Analysis of data on $\delta^{34}S$ of arsenopyrite revealed no
correlation with C_{org} and gold content. Processes leading to the formation
of gold-sulfide ore are thus considered to be polychronous and polygenetic.
Figures 4; references: 6 Russian.

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CSO: 1865/54

STUDY OF METHOD FOR DETERMINING THERMAL DIFFUSIVITY OF ROCKS USING MOVING
ENERGY SOURCE

[Article by V.V. Berezin and Yu.A. Popov, Moscow Geological Prospecting
Institute imeni Sergo Ordzhonikidze]

[Abstract] The results of comprehensive thermophysical studies of rocks made
by the authors in the Kola superdeep hole show that thermal diffusivity
independently or in combination with heat conductivity can be used in dis-
criminating lithological varieties of rocks and contact zones. In earlier
articles (IZV. VUZov: GEOL. I RAZV., No 9, 1983; No 2, 1984) Yu.A. Popov
demonstrated that the use of moving thermal energy sources in thermophysical
measurements is a basis for highly productive contactless methods for deter-
mining the thermal diffusivity of rocks making measurements possible without
mechanical destruction of samples. The most effective of these is the
parallel scanning method described by Yu.A. Popov, et al., in IZV. AN SSSR:
FIZIKA ZEMLI, No 1, 1985. In combination with the contactless high-speed
method for determining heat conductivity proposed by Yu.A. Popov, et al., in

IZV. AN SSSR: FIZIKA ZEMLI, No 7, 1983, parallel scanning makes it possible, in a single measurement, to carry out a comprehensive study of the distribution of thermal properties in samples. Real research conditions, however, differ from the theoretical model, resulting in systematic errors, the most important sources of which are related to heat transfer from the heated surfaces of samples; nonlinearity of conversion in the registry of temperature by the contactless method based on the thermal radiation of sample surfaces; limitations on the size of real samples; difference between a real energy source and a point source due to the finite size of the heating spot; finite dimensions of the region for which sample temperature is registered. Each of these systematic errors in determining thermal diffusivity is examined separately. It is shown that the total systematic error in measuring thermal diffusivity is determined for the most part by the difference between the real energy source and a point source. This systematic error can be reduced by increasing the measurement base and the rate of scanning of the samples. Figures 6; references: 7 Russian.

5303/13046
CSO: 1865/369

USE OF THERMOMETRY IN STUDIES OF HYDROGEOLOGICAL CONDITIONS IN NERYUNGRIN DEPOSIT

[Article by V.V. Nominkhanov, Neryungrin Geological Prospecting Group, Yu.A. Norvatov and I.B. Petrova, All-Union Scientific Research Institute of Mine Geomechanics and Mine Surveying]

[Abstract] Studies were made in the Neryungrin deposit to provide background data needed in arranging the necessary forced drainage required in this deposit to achieve dry conditions for mining. It was found that the "MOSHCHNYY" coal seam acts as a thermal barrier. A standard curves method was used to estimate the parameters of water percolation through the seam, computing the adjusted filtration rate with subsequent calculation of the filtration rate. The studies allow conclusions to be drawn concerning changes in the percolation characteristics through the coal seam over the area of the deposit. Thermometric observations can be used as elements in combined hydrogeologic studies of stratified water-bearing systems, allowing estimation of local characteristics of water barriers. The effectiveness of utilization of thermometric methods in coal deposits results from the singular heat physical properties of coal seams. Thermometric study results should be monitored by measuring temperatures with various ratios of the heads of interacting water-bearing strata. Figures 3.

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CSO: 1865/403

INCREASING EFFICIENCY OF GEOLOGICAL PROSPECTING WORK IN RELATIONSHIP TO
ECONOMIC STRATEGY OF CPSU

[Article by G.B. Bondarev and N.A. Sherstyannikov, Moscow Geological
Prospecting Institute imeni Sergo Ordzhnikidze]

[Abstract]   The new, revised program of the CPSU calls for doubling the
productive potential of the country by the year 2000 on the basis of scienti-
fic and technical progress and achieving radical improvement in the
utilization of natural resources. This will require efficient functioning of
the economic mechanism. The economic reform has been of great significance
for increasing the efficiency of geological prospecting work and bringing
order to the organizational structure of the national geological service.
Thirty territorial production geological administrations have been set up,
with 40 geological prospecting, geophysical and hydrogeological trusts, and
38 large production laboratories. The USSR Ministry of Geology is responsible
for providing the economy with adequate reserves of various minerals. Mini-
stries which consume mineral raw materials now need not themselves search for
deposits or prospect them. Economic stimulus in the activity of geological
prospecting organizations has greatly increased initiative in the search for
and prospecting of the most efficient deposits. Since 1969, four more
organizations have been shifted to the new economic conditions, enriching
experience in working under these conditions, but requiring an increase in
the level of party supervision of socialist competition. The Soviet economy
began to turn around in the 1970's with socialist competition at a new and
higher level, achieving increases in efficiency of production by its intensi-
fication and comprehensive improvements of the quality of work throughout the
economy. Economic and union organizations of geological prospecting parties
have done much to introduce order into all types of geological work, achieving
a savings of 12 million rubles in 1981.

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CSO: 1865/22

URANIUM AND THORIUM IN CARBONACEOUS MINERALS.   ARTICLE II

[Article by L.P. Rikhvanov, Ye.G. Yazikov and S.I. Sarnayev, Tomsk
Polytechnic Institute imenai S.M. Kirov]

[Abstract]   The mean concentrations of uranium and thorium in various
carbonaceous minerals is discussed. Graphs illustrate the variation in

uranium concentrations and the behavior of radioactive elements in the process of formation of carbonaceous mineral veins. The mean concentration of uranium and thorium in calcite is found to be significantly lower than in the earth's crust as a whole, 1 g/t or less. The anomalous concentrations of uranium in calcite are determined by its high concentration in solutions forming mineral veins. Elevated concentrations of the metal are found in minerals formed in space and time close to the deposition of productive uranium mineral associations. The concentration and nature of distribution of uranium in carbonates both change, a molecular uniform distribution giving way to an unstructured admixture of uranium minerals. The concentration of uranium in calcite and other minerals can be used to predict, prospect for and evaluate uranium deposits. Figures 10.

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CSO: 1865/22

PHYSICS OF ATMOSPHERE

FINELY DISPERSED FRACTION OF ATMOSPHERIC AEROSOL

[Article by Yu.S. Georgiyevskiy, V.I. Ivanov, V.M. Kopeykin and I.Ya. Sergeyev,
Atmospheric Physics Institute, USSR Academy of Sciences]

[Abstract] The process of formation of the atmospheric aerosol is described.
Results are then reported from studies on the composition and shape of micro-
dispersed particles. Data are presented from research on the chemical
composition and concentration of particles in the submicron fraction of
atmospheric aerosol collected at several points in the USSR. X-ray spectral
and electron microscope analyses provide data on elemental and molecular
composition as well as morphology of particles collected at Moscow, Kislovodsk,
Zvenigorod and in the Northern Caucasus on a mountain. Estimates of the mass
concentration of aerosol particles between 0.4 and 1.5 μm in diameter and soot
based on impactor samples are presented. Figures 3; references 19: 9 Russian,
10 Western.

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CSO: 1865/23

ATMOSPHERIC ABSORPTION COEFFICIENTS AND PARAMETERS OF H_2O LINES AT 1700-
2100 cm^{-1}

[Article by N.F. Borisova, Ye.S. Bukova, K.P. Vasilevskiy, I.N. Ladygin,
R.A. Liukonen, V.M. Osipov and N.I. Pavlov]

[Abstract] Experimental studies of absorption spectra of the atmosphere in
the 1700-2100 cm^{-1} band were performed using an infrared high-resolution
spectral system. The seven spectral regions with the greatest transparency
were selected for further, more detailed studies. Absorption coefficients
were corrected to a pressure of 1 atm, temperature 294 K, absolute moisture

content 14 g/m^3. Experimental results are compared with theoretical calcula-
tions and data from the literature. The results indicate that the spectrum
of a CO laser has at least 10 lines at over 1970 cm^{-1} for which the coefficients
of molecular absorption on a horizontal atmospheric path are not over 0.2 km^{-1}.
References 14: 4 Russian, 10 Western.

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DETERMINATION OF ATMOSPHERIC AEROSOL ABSORPTION FACTORS FROM ABSORPTION OF
RADIATION BY AEROSOL SAMPLES

[Article by L.G. Yaskovich, Atmospheric Physics Institute, USSR Academy of
Sciences]

[Abstract] Possible errors in determination of the absorption factor of the
atmospheric aerosol using absorption of radiation by aerosol samples are
discussed, including errors related to the method for collection of samples,
resulting from the fact that some aerosol particles do not precipitate onto
the substrate and also due to dense packing effects, improper consideration
of the coefficient of reflection of the substrate, and methodologic errors
in absorption measurement. A method is suggested for determining atmospheric
aerosol absorption coefficients, requiring precise knowledge of the capture
coefficients of the substrates used, maintenance of strict monolayer condi-
tions in sample collection, measurement of absorption in both visible and UV
bands and careful study of the optical properties of the substrate and filters.
Figures 2; references 16: 7 Russian, 9 Western.

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ESTIMATING PREINDUSTRIAL CARBON DIOXIDE CONCENTRATION ATMOSPHERE

[Article by E.K. Byutner, O.K. Zakharova and A.G. Lapenis, Leningrad Division,
State Oceanographic Institute]

[Abstract] The preindustrial content of carbon dioxide in the atmosphere is
a topic of great interest. A meeting held in Boulder, Colorado, in 1983,

attempted to establish the most probable course of variation in atmospheric carbon dioxide concentration from preindustrial time to the beginning of the International Geophysical Year, 1957. The most probable partial pressure is judged to have been 292 ppm. The range of variation of CO_2 content over the past several thousand years is considered to be some tens of ppm. Figures 2; references 16: 6 Russian, 10 Western.

POSSIBLE INFLUENCE OF SUNLIGHT ON AEROSOL ATMOSPHERIC OZONE LOSS

[Article by G.V. Matviyenko, V.D. Sireta and A.L. Skoblikova, Leningrad Hydrometeorological Institute; Leningrad Sanitary-Hygienic Medical Institute imeni I.I. Mechnikov]

[Abstract] A laboratory quantitative study was made of the influence of UV radiation on the rate of decomposition of ozone on the surface of Al_2O_3. Studies were made at 293 K in ozone-oxygen mixtures with total pressure 4000 Pa, partial pressure 40 Pa. The presence of ultraviolet light increases the rate of ozone decomposition in the first-order reaction. The studies thus show that correct computation of the aerosol atmospheric ozone loss must consider heterogeneous processes, including photocatalytic processes, in addition to the "dark" losses. Figures 1; references 9: 8 Russian, 1 Western.

VERTICAL STRUCTURE OF TEMPERATURE FIELD IN NEAR-WATER ATMOSPHERIC LAYER OVER OCEAN

[Article by Yu.A. Volkov and A.V. Soloviev, Atmospheric Physics Institute, USSR Academy of Sciences]

[Abstract] An earlier study [G.V. Astayan, et al., IZV. AN SSSR: FAO, Vol 20, No 6, pp 511-519, 1984] gave the results of use of an improved free-fall profiler for obtaining vertical temperature profiles from a height of a few meters to a depth of 0.1 m below the sea surface. These revealed a

correspondence between the mean temperature profiles in the atmospheric near-water layer and the Monin-Obukhov similarity theory regardless whether stratification was stable or unstable. It was also shown that significant temperature drops are concentrated in the atmospheric and oceanic boundary layers. Those results, however, were obtained in the coastal region of the Black Sea. A study was therefore made to determine their air temperature profile over the ocean and to compare the results with those in the earlier article. The measurements were made on the 35th cruise of the "Akademik Kurchatov" in the Atlantic Ocean during June-July 1982. The sounder descended at a rate of 1 m/s. Soundings were made from the ship at drift with the sounder being lowered from an 8-m boom. The main temperature difference between the 10-m level above the ocean and the water surface was in the 10-cm air layer above the surface. In the near-water air layer the temperature changes logarithmically with height when the wind velocity is greater than $3 \ m \cdot s^{-1}$ at a height of 10 m (a considerable temperature gradient is observed in the sublayer of heat conductivity at a millimeter scale). The mean vertical temperature profile in all cases is monotonic and there are no special layers, including inversions. The proposed method is the only practical means for studying temperature field structure near the water-air interface. Figures 3; references 5: 4 Russian, 1 Western.

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CSO: 1865/46

AEROSOL CHAMBER AT ATMOSPHERIC OPTICS INSTITUTE

[Abstract] A photograph is given showing D. Kabanov and V. Koriev, associates of the Institute of Atmospheric Optics of the Siberian Branch of the USSR Academy of Sciences, conducting an experiment inside an aerosol chamber.

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LATE ARCHEAN-EARLY PROTEROZOIC METAMORPHIC ZONES OF SHACKLETON RANGE AND
PRINCE CHARLES MOUNTAINS (ANTARCTICA)

[Article by V.S. Semenov and I.A. Solovyev, Precambrian Geology and
Geochronology Institute, USSR Academy of Sciences, Leningrad]

[Abstract] A review of the literature made it possible to clarify the
evolution of thermodynamic regimes of metamorphism in the metamorphic zones
of the Shackleton Range and Prince Charles Mountains in Antarctica in relation
to tectonic movements. These data, supplemented by information on pre-Riphean
strata and the contrasting conditions of their metamorphism, were used in
paleontological reconstructions. The data were collected during the 19th,
21st-23d, 26th and 28th Soviet Antarctic Expeditions. Figures 1 and 2 are
geological maps of the Shackleton Range and the Prince Charles Mountains,
respectively. Emphasis is therefore on the structure and development of two
Late Archean-Early Proterozoic zones of the East Antarctica craton. The
metamorphic zones of these ranges are comparable to zones of the alpine type
and are characteristic for the protoeugeosynclinal stage in crustal develop-
ment, corresponding to onset of lateral differentiation of endogenous regimes
around Archean protoplatforms. The most intense metamorphism is observed in
the Shackleton Range where there was a protoeugeosynclinal type of development.
A comparative study of metamorphic zones of the same type on other continents
revealed that such extremely intense metamorphism conditions are characteris-
tic only at trough structures whereas metamorphism regimes of moderate and
increased pressures corresponding to the kyanite-sillimanite facial series
occur in protogeosynclines with both protoeugeosynclinal and miogeosynclinal
types of development. Table 1 gives statigraphic diagrams for the two ranges;
Table 2 gives the sequence and characteristics of deformations and associated
metamorphic and magmatic processes for these areas. Figures 3; references 36;
15 Russian, 21 Western.

VARIABILITY OF CARBON MONOXIDE CONTENT IN ANTARCTIC ATMOSPHERE

[Article by A.I. Voskresenskiy, V.I. Dianov-Klokov, I.P. Malkov, V.F. Radionov
and L.N. Yurganov, Arctic and Antarctic Scientific Research Institute;
Atmospheric Physics Institute, USSR Academy of Sciences]

[Abstract] American measurements of carbon monoxide content at the South Pole
during the period 1980-1984 indicated a CO increase at a rate of 5% annually
(M.A.K. Khalil, et al., ANTARCTIC J.U.S., Vol 19, No 5, pp 204-206, 1984). A
similar study was made at Soviet Antarctic stations during the years 1977-1978
and 1983-1985. The CO content was determined from the absorption spectra for
the entire atmosphere in the IR range using the sun as a light source (the
measurement and processing methods are described elsewhere in the litereature).
Measurement of one spectrum required about 5 minutes; 10-20 spectra per day
were registered. All the measurements made at Mirnvy and Molodezrnaya
stations revealed the presence of seasonal variations of the same type as in
the northern hemisphere (maximum in early spring (September-October) and
minimum at the end of summer (January-February). Spectroscopic measurements
indicated that during the period 1977-1984 the CO content in Antarctica varied
little if at all. The rate indicated by Khalil, et al., would suggest an
increase by 35% during this period, which is refuted by the Soviet data. The
lack of any significant increase in Antarctic CO content is consistent with
the short lifetime of this gas in the atmosphere. Anthropogenic CO is
probably in large part absorbed on its path from the northern hemisphere and
the CO balance in Antarctica evidently still remains unimpaired by human
activity. Figures 2; references 13: 6 Russian, 7 Western.

ATLAS OF THE ARCTIC PUBLISHED

[Article by A. Viktorov (Leningrad)]

[Text] An Atlas of the Arctic (Atlas Arktiki), which has been published for the first time and contains more than 500 maps, can be called an encyclopedia of the North. Academician Aleksey Fedorovich Treshnikov, president of the USSR Geographic Society and editor-in-chief of the Atlas of the Arctic, told "Nedelya" about this new publication:

"The atlas is a set of maps of the physical and economic geography, geophysics, and history of exploration of the northern polar regions. It also provides information on human economic activity in this part of the planet. The encyclopedic character of this publication can be judged from the titles of its sections: 'The History of Discovery and Exploration,' 'Climate,' 'Hydrology,' 'Synoptic Processes and Abnormalities of Weather Conditions,' 'Glaciation and Permafrost,' 'Soil and plant Cover,' 'Fauna,' 'Physical Geographic Regions' and 'Population and Economy.' The atlas concludes with an 'Index of Geographic Names.'"

MORE ON ANTARCTIC EXPEDITION'S RESEARCH PLANS, AIRCRAFT, VESSELS

Leningrad LENINGRADSKAYA PRAVDA in Russian 16 Oct 86 p 4

[Article by A. Kozlovskiy]

[Excerpt] An airlift from Leningrad to Antarctica has begun again: an IL-76
airplane took off yesterday for Molodezhnaya Station. Although summer has
not yet begun on the Anatarctic continent, transport operations for delivering
participants of the 32d Antarctic Expedition are in full swing. We asked
Candidate of Geographic Sciences V.D. Klokov, director of scientific research
during the present season, to tell about the program of this research.

"Creation of an alternate runway for heavy airplanes in the vicinity of
Novolazarevskaya Station has heightened the reliability of air transport
operations in the Antarctic. Geological studies will be continued in the
Prince Charles Mountains, and gravimetric measurements and radar mapping from
a flying laboratory on board an IL-14 airplane will be continued in the
western part of Enderby Land and in the coastal-shelf zones of the Cosmonaut
and Commonwealth seas, over an area of about 160,000 square kilometers.

"Radiophysical studies which will be made during a land trip into the con-
tinent's interior over the route from Mirnyy Station to Komsomolskaya Station
are of much interest. Discontinuities in the glacier sheet here have been
discovered with the aid of artificial earth satellites. Scientists will now
study the nature of these discontinuities in detail.

"Eight ships in all will set out for the southern oceans during this expedi-
tion. Five of them will carry out research programs in addition to transporting.
Research aimed at studying large-scale circulation of the eastern part of
Weddell Sea and in its northern part is to be conducted from the 'Professor
Vize' and the 'Professor Zubov.' Moreover, the 'Professor Vize' will make
hydrologic measurements along the 20th degree of East longitude between Africa
and Antarctica.

"Plans call for seismoacoustic and gravimetric measurements to be made from
the motor ship 'Kapitan Kondratyev' in the southern part of Weddell Sea.
In line with the same program, the motor ship 'Vasiliy Fedoseyev' will work
in Prydz Bay.

"The 'Mikhail Somov' will continue research of ice and hydrometeorological conditions of the southern oceans in the Indian Ocean and Pacific sectors, as well as studies of floor relief and features of synoptic processes in the Southern Hemisphere with the aid of satellite apparatus."

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AERIAL SURVEYING, ORGANIZATION OF NEW BASE IN ANTARCTIC PLANNED

Leningrad LENINGRADSKAYA PRAVDA in Russian 9 Oct 86 p 4

[Article by A. Kozlovskiy]

[Excerpt] An IL-18D airliner which took off from Leningrad yesterday will make an intercontinental flight more than 15,000 kilometers in length, over the Leningrad-Maputo-Molodezhnaya route. This airplane will deliver the first contingent of members of the next Soviet Antarctic expedition, the 32d.

The Antarctic produced its latest unpleasant surprise exactly one week before the first airplane departed. As has been reported, a break in the Filchner glacier, which is on the coastal shelf in the vicinity of Weddell Sea, occurred on October 2. The Soviet seasonal geological-geophysical base "Druzhnaya-1" was on a section of ice which split off from the glacier. None of the people assigned to this base were there when the break occurred; the scientists were still preparing for the trip. Most of the passengers on the airplane that left yesterday happen to be geologists and geophysicists. To what extent will the events that have occurred prevent the polar specialists from carrying out their research plans? We addressed this question to Yu.M. Zusman, head of the Arctic and Antarctic Scientific Research Institute's department of Antarctic expeditionary research:

"The scientists who left for the Antarctic yesterday will work in the vicinity of Molodezhnaya Station. They will use the IL-18D as a laboratory airplane and carry out a large amount of aerial gravimetric work in a survey area covering more than 60,000 square kilometers in the eastern part of Enderby Land.

"At our institute, all incoming information from Molodezhnaya Station and from artificial earth satellites is now being carefully analyzed, and attempts are being made to interpret photographs; we want to find the 'Druzhnaya-1' station and understand the nature of the changes in ice conditions which have taken place in the area of iceberg dislocation. With the aid of helicopters, aerial ice reconnaissance will be done from one of the expedition's ships as it approaches this area. Organization of a new base, 'Druzhnaya-3,' will undoubtedly become a first-priority task."

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FINNISH FIRM BUILDING ANTARCTIC EXPEDITION SHIP FOR USSR

Moscow PRAVDA in Russian 24 Sep 86 p 6

[Article by V. Chebakov]

[Excerpt] A vessel for scientific expeditions to Antarctica is being built
at a shipyard of the Finnish stock company "Rauma-Repola." It was designed
by Finnish engineers in close cooperation with specialists of the USSR State
Committee on Hydrometeorology and the foreign trade association "Sudoimport."

Seamen and polar explorers have always dreamed about a ship that would be
designed taking into account all the 30 years of experience of Antarctic
expeditions, plus the achievements of electronics and other present-day tech-
nology. Such a ship is now being built at the shipyard "Rauman Telakka."

"Possessing good performance qualities in clear water, the ship has a
reinforced hull, which will allow it to become an icebreaker in year-round
ice and to operate at low temperatures," said Antti Potila, general director
of "Rauman-Repola." "It has cabin space for a crew of 90, including research
scientists and helicopter crewmen, and also for 160 passengers to be trans-
ported to and from Antarctic stations."

The deck has room for transporting land vehicles, airplanes, helicopters
and storage tanks. The ship is equipped with cargo tanks for liquid fuel,
holds for machinery and equipment, and refrigerated storage area for food
products. There is a separate hold for gases, acids, and explosives. Four
cranes with a combined capacity of 120 tons will allow cargo to be handled
quickly. If necessary, a traveling crane can become a gangway onto the shore.
The ship's equipment also includes tractors which can work on ice, and two
heavy boats. A helicopter platform is located at the stern. Helicopters
also can be used for cargo handling.

Another feature of the ship is that it will have 10 laboratories on board:
hydrologic, hydrochemical, hydrobiological, aerologic, meteorological and
others. Special winches will enable scientists to bring up samples from
depths as great as 6,000 meters. Results of research will be processed in
the ship's computer center. Much of the ship's equipment is Soviet-made,
including computers, navigational devices, and some of the research instru-
ments.

The new ship for the Antarctic will be turned over to the Soviet Union next summer, and in the autumn it will depart on its first voyage to the sixth continent. It will be named the "Akademik Fedorov."

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PLANS FOR 32d SOVIET ANTARCTIC EXPEDITION

Moscow VODNYY TRANSPORT in Russian 30 Sep 86 p 4

[Article by G. Bregman]

[Excerpt]   Preparations for the next Soviet Antarctic expedition, the 32d,
are being completed. Taking part in this expedition will be more than 1,300
specialists of the USSR State Committee on Hydrometeorology and Monitoring
of the Natural Environment, the USSR Academy of Sciences, the ministries of
the merchant fleet, civil aviation, and geology, and the Main Administration
for Geodesy and Cartography. The first ships and airplanes will set out for
the Antarctic continent in October.

"Important scientific and practical tasks have been set," related N. Kornilov,
deputy director of the Arctic and Antarctic Scientific Research Institute.
"In line with extensive national and international programs, both year-round
observations and seasonal ones will take place in branches of earth science
such as aerometeorology, geophysics, glaciology, oceanology and geodesy.

"Eight vessels will sail to the Antarctic. Participants in cruises of the
research ships 'Professor Vize' and 'Professor Zubov' will conduct comprehen-
sive studies in Antarctic waters, in line with the program 'Polyarnyy
Experiment--Yug.' Seismoacoustic measurements will be made from the motor
ships 'Vasiliy Fedoseyev' and 'Kapitan Kondratyev' in the Weddell and
Commonwealth Seas. On the coasts of Lazarev Sea and Prydz Bay, expedition
members will scout and assess sites for the creation of two new stations there
in the near future."

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